SCIENTIFIC AMERICAN

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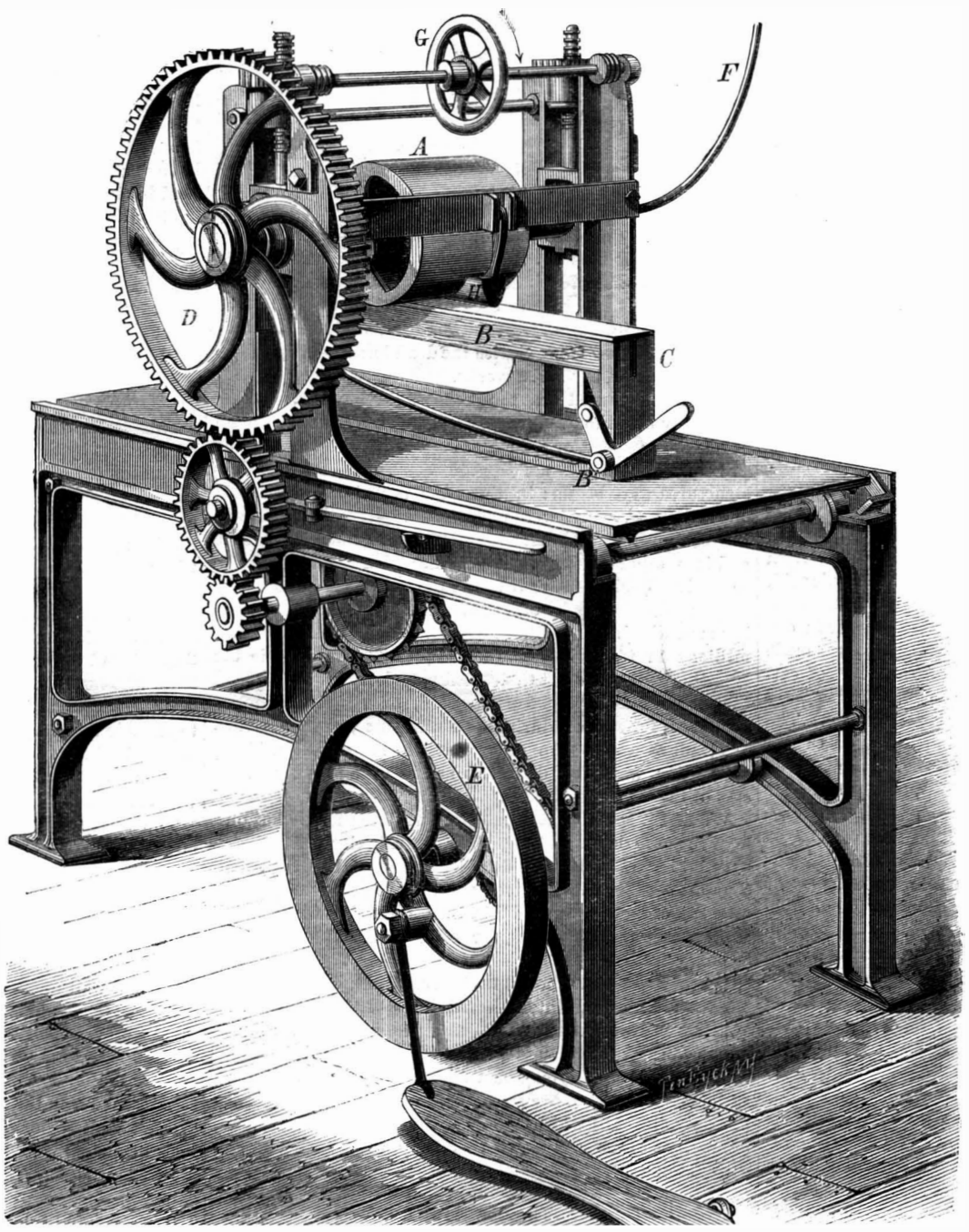
IMPROVED HOT-PRESSING MACHINE.

We illustrate herewith a new device designed for the quicker and better pressing of seams of cloth garments, and also for use in laundries for ironing purposes. It affords a means of working with a regular and continuous heat which cannot be obtained by ordinary hand pressing.

In our engraving, A is a metal cylinder which is heated by means of a perforated gas tube inside, the gas being supplied through the pipe, F. B is the sleeve board, which fits on a rest, C, which is fitted on the rolling table. The sleeve board may be raised or lowered by actuating the lever and connecting rod, B'. By rotating the hand wheel, G, in the direction of the arrow, the cylinder, A, is lowered and the pressure applied. The garment is placed in suitable position on the sleeve board; motion is then imparted to the wheel, E, by the treadle, and is communicated to the gearing, D. By this means the cylinder, A, is revolved, and simultaneously the table and sleeve board are carried along by the same gearing at the same speed. As the seam comes under the cylinder it is opened by the seam opener, H. The seam only is thus pressed, and it is simply necessary to raise the lever, B', to release both garment and sleeve board without interfering with or altering the position of the cylinder.

For pressing the seams of cuffs or other circular work, a small roller is used which takes the place of the sleeve board, and is quickly attached under the ironing roller. For kinds of work broader than sleeves or trowser legs, a lapelle board replaces the sleeve board; and as these boards merely drop into slots in the brackets on the rolling table, they are easily and quickly removed and exchanged.

The advantages claimed for the machine are that it will do the work of six competent pressers, or even of double that number if a man be stationed at its either end, passing garments through both ways. It is also stated to effect a great saving of time, to render the seams better pressed, and to obviate all danger of the accidental burning of clothes by too hot irons. The heat is uniform and safe. It is believed that the economy of fuel and time, caused by using this invention, will save its cost in a short time.



HOT-PRESSING MACHINE

The Vienna Exposition.

As at the Paris Exhibition of 1867, so at that of Vienna, the Sultan of Turkey and the Khedive of Egypt are likely to shine above all others. The former will present a complete Turkish dwelling house, with harem and selamlik. It is finished outside, and is a close imitation of one of those thousands of gaily painted wooden structures which you see along the Bosphorus. Close by you see some dozen Greeks and Bulgarians at work running up the lath and plaster structure, which will be a bazaar and coffee house. This speedy and original mode of building created quite a sensation at first among the workpeople, especially the Italians, who, quick at learning, soon appropriated some of the tricks of the Turkish Exhibition builders. The real show buildings of the Turkish Exhibition will, however, be a close copy of the famous fountain of the Sultan Ahmed, standing between St. Sophia and the entrance gate of the old Seraglio, and the building in which the so much talked of Turkish Imperial treasure of jewels will be exhibited.

As for the Khedive, his buildings will cover a space of not less than 5,500 square meters, nearly half an acre, and present illustrations of all Egyptian styles of building from the Pharaohs downward. There will be an imitation of the tombs of Beni Hassan. Then there is to be a dwelling house in the best Arabian style of the caliphs, the shell of which is already finished, and which even in its unfinished state presents by far the best proportioned building in the whole place, only it is in proximity with a mosque on one side and a gallery leading to a tall minaret of 250 feet on the other, which rather spoils the effect of the central building. The minaret imitations, which are of the best models, are, indeed, graceful additions; but the mosque is a decided failure. Behind this group is to be a complete Egyptian farm, with the classic water wheel, the pigeon cot, and the ovens for hatching eggs.

If anything, private energy and industry outside the Exhibition almost surpasses that displayed inside. To the north of the ground extends the People's Park, while to the west of it, along the main avenue of the Prater, extends that of the "Upper." All those hundreds of booths, gardens, inns and show places of the former have been transformed as if by magic. Most of them have been entirely rebuilt on a more pretentious scale, while the rest have been so renovated that you can scarcely recognize the old, homely, but rather dingy places. The grandest effect is, however, that of the fashionable *café*, No. 3, the last alongside the main avenue. A hall is in process of construction to contain 5,000 people. There are to be two rows of boxes, a theater, orchestra, etc.,—in one word, a place fit for any universal or theatrical exhibition. It will require all those millions of visitors on the presence of whom the Chief Commissioner reckons to pay for all these outlays; but, if they do come, they will have no reason to say that great preparations have not been made to receive them.

AT a meeting of the stock-holders of the Williamstown cheese factory, a dividend of 10 per cent was declared. The report showed a net production of 78,000 pounds for the year. The cheese manufactured at this establishment commands as high a price as any made in the country. Nearly half the amount produced was exported.

PRACTICAL experience shows that paper mills may be run by steam power with more certainty and economy than by water power. The exhaust steam from the engines may be used to heat dryers and calendering rolls.

A New and Useful Photo Improvement.

A new method of enlarging photo negatives, by which any photographer, without the use of solar camera or other apparatus, may successfully produce large prints from small original negatives, is thus described in the *British Journal of Photography*. Collodio-bromide collodion, that is, a collodion emulsion containing nitrate of silver, is employed, formulas for which have been several times given in the SCIENTIFIC AMERICAN. The method is as follows:

Let an enlarged transparency be taken on a collodio-bromide plate by means of any of the copying cameras, magic lanterns, or other methods of producing enlarged images, now so well known to photographers. Then develope the image by alkaline pyro., taking care, of course, not to use any silver. Continue the development until every detail is well out, then wash the surface and pour over it some slightly diluted nitric acid. Presto! the transparency instantly becomes a negative, which, after being slightly intensified and varnished, may be used for the production of pictures on either carbon paper or albumenized silver paper. This is the whole process, and we shall now make one or two comments upon it.

First of all, no large silver bath is required. This is a somewhat serious matter when only one or two pictures are required of the dimensions of perhaps 25 by 20 inches. All that is necessary is to coat the plate with emulsified collodion, which can now be so made that it will keep, and be always ready for use, for a lengthened period of time. This done, the plate is then immersed in a dish of water, the dish being composed of wood, gutta percha, porcelain, varnished pasteboard, or even japanned iron. When the water flows evenly over the surface, the plate is then to be lifted up and placed upon its support in the darkened room, or in its frame if a large camera be used. The image, having been previously focussed upon another plate, is now allowed to fall upon the sensitive film for a few seconds, or even minutes if the light be bad; at any rate, for such an exposure as would be given to an ordinary bromo-iodized collodion film sensitized in a silver bath and exposed while wet. The light is then stopped, the plate levelled, and pyrogallic acid, without any silver but rendered slightly alkaline by a drop or two of solution of ammonia, is applied. The image now appears, and in the very nature of things there can be no stains in the shadow. If preferred, a flat bath can be used for developing in, for the same developing solution can be used over and over again.

The nitric acid, too, can be applied by means of a bath if it be desirable, and its function shall have been adequately performed when the high lights, previously a dense deposit, are seen to consist of clear glass, which will most assuredly be the result of the treatment with acid. Observe that the acid must not be thrown away, for the longer it is used for this purpose the more valuable it becomes, because every tyro in chemistry knows it becomes richer in silver with every plate immersed, until at length it becomes quite saturated with nitrate of silver, which may be utilized for other purposes, or may be reduced into metallic silver.

The enlarged negative, still too feeble for printing from, is next washed and held in the light for a few seconds. It is then returned to the developing tray and is immersed in the same alkaline pyrogallic solution by which it was first developed, when the whole of the bromide left in the film will be reduced, forming a negative as dense as may be desired; or, should sufficient density not be obtained, the application of acid pyro. and silver will give absolute opacity. No fixing beyond a wash in water will be required.

The negative can be made direct or reversed at the will of the operator, this being determined by the side of the original negative that was placed next to the enlarging lens.

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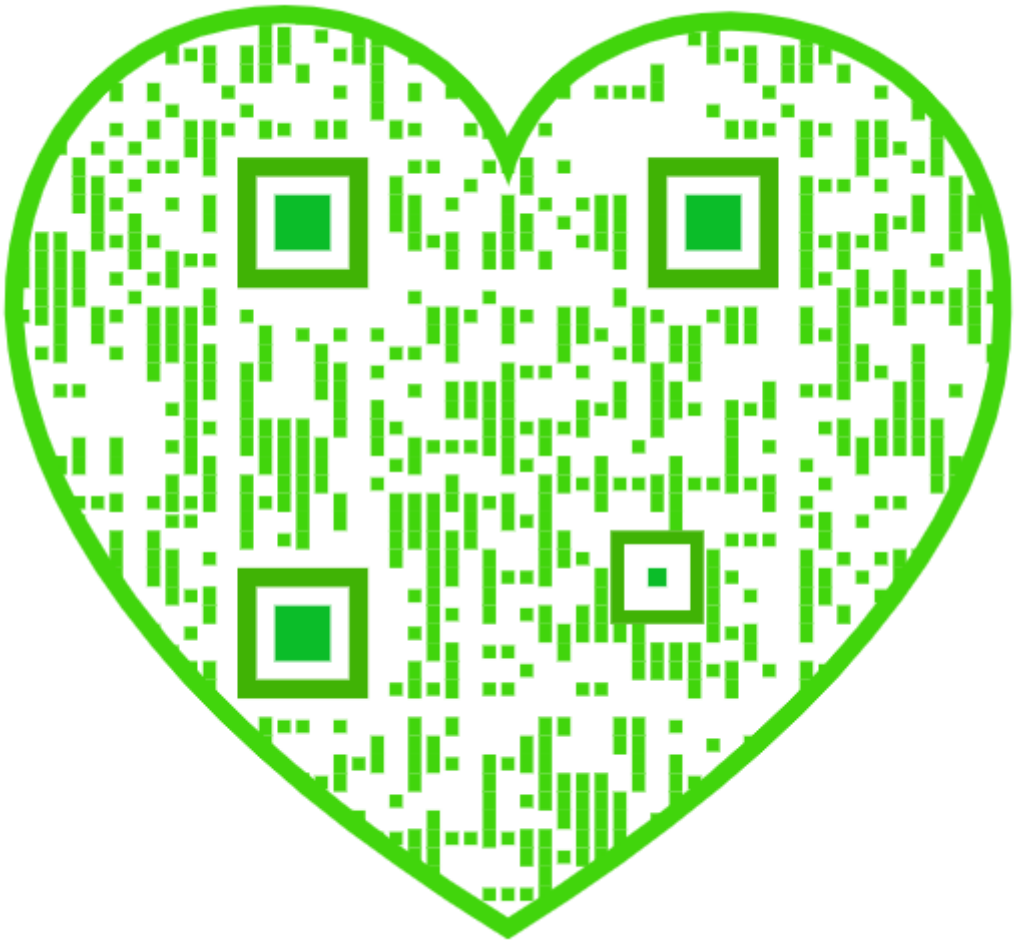

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POISONOUS AIR IN SCHOOLS AND FACTORIES.

The City Sanitary Inspector of New York has recently published a report relative to the bad ventilating arrangements of numerous public schools and manufactories within the corporate limits.

We find it stated that the analysis of samples of air from two factories gave 0·14 to 0·16 of 1 per cent of carbonic acid. In the public schools, the quantity of the deleterious gas varied from 0·09 to 0·35. An examination of the air in one of the class rooms provided with a ventilating flue was made while a window was open, yielding 0·17 of 1 per cent of carbonic acid. The window was then closed, and after a lapse of ten minutes the proportion had increased to 0·32. The trial then became so oppressive to the inmates of the room that it was discontinued, though the opinion is given that, had the experiment continued for an hour, no less than 1·1 per cent of carbonic acid would have accumulated. The magnitude of the above percentage of the deadly gas may be estimated from the fact that Dr. Parkes and other high authorities consider 6 parts of carbonic acid in 10,000 parts of air, or 0·06 of 1 per cent, should be the greatest permissible impurity.

Although the above details indicate the deleterious nature of the atmosphere of a crowded and ill ventilated school room to no small extent, they exhibit but a portion of its noxious properties. Not only is the air vitiated by carbonic acid, but by effete organic matter, to which is due the close smell of such apartments. The Inspector, it seems to us, omits an important portion of his investigation when he fails to state the percentage of oxygen, as shown in the samples of impure air which were subjected to his analyses. Graham and Liebig show that the mean amount of oxygen in the atmosphere is 20·9 volumes per cent. Dr. Angus Smith considers that air containing a less percentage than 20·7 is very unwholesome, but adds that the average might be reduced far below that found in circumstances of daily life without occasioning great discomfort, thus proving the seductive and insidious nature of exhaled air. The same authority in the course of experiment noticed nothing more than a slight feeling of closeness when the percentage of oxygen was diminished to 17·45. The small proportionate quantities of carbonic acid are less easily determined than the larger variations in the amount of oxygen, while the absence of the latter is fully as deleterious to health as the presence of the former. Experiment has further shown that an atmosphere containing 18·8 per cent of oxygen and 2·28 per cent of carbonic acid will fail to support the combustion of a candle flame, and yet may be breathed without great discomfort. According to the instance cited above, a room full of people found air, that contained not one half the proportionate amount of carbonic acid just given, very oppressive. It is evident that the closeness of the atmosphere was not due to the excess of carbonic acid to nearly so great an extent as to the deficiency in oxygen; and to the accurate determination of this deficiency, attention should have been especially directed.

The subject of proper ventilation has been so thoroughly discussed of late that it would be useless repetition to again urge its importance. Workmen in badly ventilated factories should take the matter in their own hands and decline to labor in buildings where no means are provided for changing the foul and noxious air, while parents would act wisely in removing their children from the schools specified in the Inspector's report, until they are satisfied that proper sanitary precautions are taken.

PRACTICAL RESULTS OF THE EIGHT HOUR PLAN IN NEW YORK.

The evil results of the eight hour movement of last summer, which for nearly eleven weeks paralyzed the industries of this city, have during the present winter been severely felt. The exhibit of our Commissioners of Charities and Corrections shows that the number of industrious and unemployed poor craving the benefit of public charities has been unusually large, while such statistics as have been gathered indicate serious losses both to employers and workmen in many branches of trade.

It will be remembered that among the builders the strike first began, and that although a certain proportion of the employers having unfulfilled contracts on hand were coerced into acquiescence with the demands of their operatives, many preferred to incur the penalties of their agreements rather than yield; while others succeeded in temporizing with their hands until after the failure of the movement was assured. It is probable therefore that this trade, being the first affected, suffered with even greater severity, and indeed bore a larger share of the loss, than any other industry involved in the unfortunate struggle. This view we think may be safely based upon a comparison of the records of the building trade for corresponding periods in 1871 and 1872, the tabulated statistics of which we find in a pamphlet signed "Practical Builder" recently received. From May 27th to November 30th in the first mentioned year, 1,333 edifices were erected and alterations made in 310 more. Of these 528 were first class structures of an average cost of $18,000: 53, factories and workshops averaging $8,000, and 33, hotels, public buildings, and churches averaging $200,000 each. The aggregate sum invested in all for the twenty-seven weeks was $25,672,000. Comparing this with the same months in 1872: of first class edifices but 107, of factories 29, hotels etc., 16 and altogether but 707 buildings and 287 alterations were completed at an aggregate cost of $12,821,000. Deducting this total for 1872 from the total for 1871, we have a result of $12,851,000, which indicates the dead loss to city improvements in the twenty-seven weeks.

It cannot be urged that the year would have been a dull one in any event for the trade, as the spring opened with an excellent prospect for a busy fall. During September (the principal month for making contracts), 1871, 108 first class structures were begun: in the same period in 1872, but 9, one twelfth as many, were undertaken. Here then is nearly thirteen millions of dollars forced out of the building trade and into other channels. Estimating labor at one half the cost gives $6,425,000, as a dead loss, not to capitalists who can save themselves by other investments, but to the working men who have no other support. Almost six and a half millions in twenty-seven weeks—$39,663 per day—is the sum these men paid for their strike, and if we should add thereto the outside expenses incurred, of which the money borrowed, for support during its continuance, from the various trade associations in other coies, forms no inconsiderable portion, we should doubtless arrive at a total far in excess of the largest estimates.

We find it stated that at the present time there is but one fifth the amount, of first class work in this city to be carried over into spring, of that done last year, and that to employ the same number of men and they to average the same quantity of labor as they did in 1872, there is not 4½ hours work per day this season, for each man employed in the building trade.

Let us add that we notice that recent daily journals chronicle the fact that the International Society has made its head quarters in New York, and is seeking to instil into the minds of our workmen the baleful and communistic principles of its organization. It may be well for the men to consider such facts as those above stated before joining an association the only object of which is to lead them into further strife, productive of no results, save misery to themselves and their families.

FOUL AIR SIGNAL.

We abound in inventions to warn us of fire and to alarm the household of the approach of a burgler; but there is an insidious foe who enters everywhere, in every apartment of private houses, and riots unmolested in all public places, of whose presence we are not warned in time to make good our escape. We refer to bad air. It is perfectly notorious that no public or private buildings are adequately supplied with ventilation, and the consequences are more injurious than we are apt to believe. In default of suitable ventilation, it would be well to have some kind of a signal to warn us of the danger, or a contrivance to automatically open a door or window. The presence of fire damp in mines is made known by the explosion of the small volume of air in the Davy safety lamp. When this explosion takes place in the narrow compass of the wire gauze, the miner knows that it is better to retreat until the dangerous gas can be blown out. Unfortunately the gases of close rooms are not of this explosive character; if they were, we should not suffer so much from bad ventilation as we now do, as no one would run the risk of being blown up for the pleasure of being suffocated. The gas which leaks through stoves and furnaces and arises from imperfect combustion, known as carbonic oxide, can be absorbed in a way to betray its presence by the following ingenious invention: The apparatus consists of a small galvanic battery with a bell attached, and an open test tube containing liquid chloride of palladium. The chloride of palladium is extremely sensitive to the presence of carbonic oxide gas; it absorbs the gas and precipitates metallic palladium; the deposition of the metal in the bottom of the tube makes the connection of the galvanic current and at once rings the bell which will not stop until the current is broken. The invention is found to work admirably for carbonic oxide gas, and the next thing is to devise a plan for disclosing the presence of carbonic acid gas. It is possible that this could be done by putting in a carefully counterpoised balance some caustic baryta or lime which, by the absorption of the carbonic acid of the air, would sink and cause the current to be closed in a battery and the bell to be rung. The same contrivance could be made to open and close a shutter just as the draft of a stove is regulated by the rise of mercury in a thermometer connected with a battery. It would be a novel experience on any public occasion to have the proceedings interupted by the ringing of bells until equilibrium was restored by proper ventilation. We should all take kindly to the interruption and be thankful for a whiff of pure air. Let us by all means have a palladium ventilating company organized, for the benefit of gasping humanity.

INVERTEBRATE MEN.

When a young man, more than ordinarily useless to himself and friends, had no other occupation, he used to sit down and write a letter to Horace Greeley, pretending that he wanted work, would do anything to get it, and that, if society in general had not turned against him, he would be able to prove himself capable of great things. To beg he was ashamed, and dig he could not, because it made his back ache; so he sat down and emptied all his woes on Mr. Greeley's head, and really felt that he had achieved some distinction if Mr. Greeley replied and told him to go out West. It is needless to say that he never went, although he should have gone, in common with thousands of his congeners who herd in cities, lie in wait for the hapless advertiser, and precipitate themselves, not as individuals but as a horde, upon any one who dares seek assistance in the columns of the daily papers. For, be it known, the young man of the period is as useless as he is ubiquitous. He cannot longer stand on street corners, for that is against the statute, but he can live on his father, his widowed mother, possibly even his school-teaching sisters, pretending the while that he is always seeking employment, always laboring in the vineyard in one form or another.

This jeremiad against a useless class of non-producers is brought out by the result of three or four months advertising at various periods for a young man to fill a certain post requiring an ordinarily facile pen, a knowledge of simple commercial forms of expression, and familiarity with business routine; yet it will hardly be credited that, out of hundreds who applied and were examined, scarcely ten could be found who gave even a promise of succeeding. Vague, uncertain, indirect, willing to work for anything and at anything, having no especial fitness or adaptation for any particular line, they formed the rank and file of the noble army of incompetents who hew the wood and draw the water for their betters. And yet the advertisement in question was specially worded to exclude this very class! Knowing that there were ten incapables in the world for one expert, it called for an exceptional man, and the very class who rushed in were those who are said to rush in where angels fear to tread.

The question presents itself to every thinking man: Where do all these young men come from? In what school have they acquired their aimless, uncertain, vague ideas of duty, of work, of application, of achievement? What do they expect to do in the race of life before them? Do they mean to be entry clerks all their life long? Do they mean to be book keepers at $1,000 or $2,000 a year forever? Will they stand and wait upon the ringing of a bell, and answer some great man's nod and beck? Will they, pending an engagement for even their superfluous ability, continue to wring the hearts of aged parents, hardworking sisters and relatives as poor as they? These are questions hard to answer, but safe to answer in the affirmative. The riddle, never solved, "What shall be done with them" is a serious one. If Satan finds business for idle hands in this city, he must do a thriving trade, judging from the applications received for a clerkship.

It is a sad and solemn question, not to be lightly dismissed on a moment's reflection, a question reaching further than mere technical or professional education. Schools may abound in the land and colleges shoulder each other in a line across the continent; but the aimless, uncertain, purposeless man will still exist unless, from his youth up, his parents exhort him to stand on his own feet, to rely on his own arm, to think for himself, to follow some one line and make himself perfect therein. Then shall a sturdier manhood be apparent, a nobler race spring up; and if one seeks assistance and casts forth his drag net, he shall find it filled with applications that give some evidence on the face of them of the writer's ability to perform his undertakings. It matters little whether a man be a hewer of wood or a drawer of water; there must be such; but it matters greatly whether a man be competent or not for the line he assumes.

THE KNOWLEDGE OF THE TRUTH.

The ancients had no knowledge of the sciences which at present form the domain of the most important and influential of all human pursuits, namely, the investigation of Nature, the explanation of its phenomena, and the application of the wisdom thus obtained for educational training and practical useful purposes. Their philosophical systems were only imaginary cosmologies, basedon a few hypothetical principles. The great philosophers, often so boastfully referred to by those whose knowledge is exclusively confined to the philological branches: Thales, Pythagoras, Democritus, etc.: produced only speculations concerning Nature; and, notwithstanding that they sometimes hit the truth, their ideas were largely mixed up with metaphysical notions, and they only occasionally brought forward conclusions, and these were based

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on ill observed natural phenomena. Even Aristotle, without doubt the first physicist and philosopher of antiquity, is himself the best proof that the ancients did not know anything worth mentioning about the physical sciences. As a specimen of the ideas of the most advanced minds of Roman antiquity, we will give here a literal translation of a passage from T. Lucretius Carus, a very esteemed Latin author who flourished about the year 50 B. C. The writer, in his celebrated work, *De Rerum Natura* (on the Nature of Things), thus speaks:

"The elements, out of which our earth is composed, have, after the first chaotic confusion, flown together, and, by reason of their own weight, occupied the lowest space; the more those heavier matters were condensed, the more they squeezed out the thinner lighter ones, which then composed the sea, the stars, the sun and moon, and the limits of the universe. Because all these objects are composed out of much smoother, rounder, and smaller seeds than the earth: for this reason the heavenly vault has first gone up, carrying with it many luminous little flames burst through crevices out of the component elements of the earth, nearly in the same manner as happens when, in the early morning, we see the golden sunbeams radiating on the leaves covered with fresh dew which has been evaporated from rivers and swamps as fog and vapor; we see then sometimes even smoke ascending from the earth," etc. A little further on we read as follows: "After the heaven had obtained its shape, the elements of sun and moon succeeded, which neither heaven nor earth could appropriate, as they were not heavy enough to take the lowest place, nor light enough to occupy the highest, and to assist in the formation of the highest regions. The sun and moon are thus placed between heaven and earth, moving themselves as if they were living bodies, constituting the principal parts of the whole world, in the same way as some parts of our bodies may remain motionless, while other members can move themselves," etc.

These are only samples of the rest, which is not in the least better; and incredible as it seems, it is a fact that the literary savants of civilized Europe, of only one century ago, called this very book of Lucretius Carus "an elegant explanation of natural philosophy, based on intelligent and easily understood principles." Out of respect for the ancients, we would rather be inclined to accept the theory of Hardouin, who attempts to prove, by critical considerations, that this and other works attributed to old Roman authors are the product of some monks of the 13th century. He only makes an exception in regard to Cicero and a few others, concerning the authenticity of which nobody can have any doubt.

Notwithstanding that there has been a great deal of inigenuity wasted in trying to prove that the world is retrograding, and that there are such things as "the lost arts" of the ancients, and notwithstanding that we justly confess our admiration for many products of antiquity, as well of the mental as of the material kind, it cannot be denied, if we are not wilfully blind to the progress of our times, that the ancients knew scarcely anything practically useful at all. To what did their knowledge of acoustics and music amount? What did they know of electricity and magnetism? They even ignored the existence and weight of the atmosphere; and of the nature of light and heat, they could not form the remotest conception. Even the Greeks, who left us such precious models of eloquence, poetry, sculpture, and architecture, were, in regard to the clear conception of natural phenomena, not further advanced than our American Indian savages. As soon as observation was substituted for mere speculation, progress began; in other words, as soon as man commenced to abandon his bad habit of indulging in the full scope of his own imagination, and in place thereof acknowledged Nature as a teacher, he commenced to learn something.

The whole human race of the period of antiquity had the defect which may still daily be noticed in certain individuals, old as well as young, who have not yet attained the docility of mind necessary to absorb knowledge from without. Such persons, instead of listening to what others may communicate to them, have the bad habit of hindering their instructors with accounts of their own suppositions and theories, which are often utterly absurd. Who has not met persons who love to hear themselves talk? These people have the very worst prospect in regard to their further mental progress, and are the very opposite of the far superior class who are able to listen patiently to what others have to say, and to gather knowledge from exterior sources, in place of from within, from their own conceited imaginations, which as experience should have taught them, over and over again, are utterly worthless.

It is especially the investigator of Nature's secrets who must train himself to mind with docility her teachings, who must patiently and carefully watch all the phenomena, during an observation or an experiment, and especially foster no previously conceived theories; but, above all things, he must value the greatest boon which man can ever possibly attain: The Knowledge of the Truth.

COLBURN'S THEORY AND THE BOILER EXPLOSION AT PITTSBURGH.

One of our Pittsburgh subscribers sends us two extracts from the *Evening Chronicle* of that city, in which are considered the causes of explosions, with particular reference to the terrible disaster at the American Iron Works, of which we published a description in the SCIENTIFIC AMERICAN of February 22, on page 112. He asks us what we think of the views of the writer of the article on the subject of the intensity of explosive force by the sudden evaporation of large masses of water relieved from pressure.

The writer says:—"Now suppose a rupture to have taken place in any one of these four boilers, above the water line; before the steam, rushing out at initial velocity of two thousand feet per second, was exhausted from the steam space, it would, being liberated from the water contained in the water space, rush from the water along with a portion of the water itself and strike with immense velocity upon the upper part of the boiler, rending it in a manner to produce the most startling results. Supposing 1,066 cubic feet of water in each boiler was converted into steam; upon the liberation of steam contained therein, this would make 30,000 cubic feet of steam (at the pressure of the atmosphere); and this, acting expansively upon fragments of the boiler already hurled into the air with great velocity, would be sufficient power to account for large portions being carried one hundred rods or more from the scene of the explosion. Here were 120,000 cubic feet, or more than two tuns, of vapor in the atmosphere surrounding the boilers; sufficient force and sufficient gas in all conscience to account for the destructiveness and the 'blue gas' without resort to the superheated steam, or the burning of an explosive gas within the boilers." The views here expressed are, by leading authorities, generally believed to be well founded. We believe that this theory, which is known to engineers as "Colburn's Theory," was first given its present form by our late talented fellow countryman, Zerah Colburn. The extraordinary violence with which explosions frequently occur are good evidence of its probable correctness in many instances.

It is by no means certain, however, that the effect of this sudden liberation of immense volumes of steam is, in all cases, to appreciably intensify the disastrous effects succeeding the explosion. The only experiments which have ever been made on a scale sufficiently large to permit us to make reliable and unexceptional deductions are those of the United Railroad Companies of New Jersey, which were conducted by Mr. F. B. Stevens. One of these allowed of quite reliable estimates of the intensity of this effect, It was shown by Professor Thurston (*Journal of Franklin Institute*, March, 1872), in an examination of this experiment, that "the energy of this explosion and all of its tremendous effects were principally due to the simple expansion of a mass of steam suddenly liberated at a moderate pressure, by the general disruption of a steam boiler of very uniform but feeble strength," and that "in this case, the liberation of steam throughout the mass of water contained in the boiler, and which resulted in setting free nearly 70.000 cubic feet of steam, would not seem to have taken place promptly enough to greatly intensify the effects of this explosion."

We have no evidence which enables us to form a decided opinion in regard to the cause of the boiler explosion to which our correspondent refers. We can only say that the almost invariable, and possibly absolutely invariable, inference, which we draw when we read of an explosion, is that there has been either ignorance, carelessness, or recklessness somewhere, for which some one is responsible, and of which some one should be made to suffer the just consequences.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE EFFECTS OF SUPER-OXYGENATED AIR.

A correspondent, L. G. F., of Las Vegas, New Mexico, speaks of the extremely exhilarating air of his locality, and states that it is very invigorating, and any stimulant is doubly injurious in such a climate. Sometimes a visitor will come in, with glasslike eyes starting from his head and incoherent speech. Persons so affected invariably attempt to get near a fire; but L. G. F. finds the best treatment to be to keep them far from the stoves, and to administer food and hot coffee to stimulate the stomach into action to replace the carbon lost by super-oxygenation of the blood. Riders on horseback are not thus affected; probably the vapor from the horse's body uses up a large proportion of the oxygen near him. L. G. F. recommends phosphorus in small doses, as, in addition to its well known stimulant effect on the brain, it will appropriate the superfluous oxygen of the air, and stop the exhaustion of the carbon in the system, which would otherwise become too rapid for the patient's health.

THE FUENTA DE SANGRE IN HONDURAS.

Our correspondent, O. L., of N. Y., has in his possession a quantity of a red fluid, taken from a cave in Honduras. The liquid runs down the walls and collects on the earth. The place is called by the natives the *fuente de sangre* or spring of blood, and was, for centuries, considered to be caused by a Divine miracle. Dr. A. Habel, who traveled Central America during many years, preserved the specimen in question, and added a little alcohol to prevent decomposition. The fluid, when observed by the help of a microscope, exhibits some colorless rhombic crystals and also some reddish brown amorphous particles, as well as organic fibers and cells. To the smell, ammonia is distinctly present in it, and the odor becomes intensified by the addition of caustic soda. The ammonia was volatilized by heat, and the red brown residue was imperfectly soluble in water. The salts of lead, of silver, and of copper were precipitated from the fluid, and the deposit was found to be completely soluble in alkalies.

This precipitate evolved, on heating, the odor of burnt horn, and a considerable quantity of carbon was found in the residue; after perfect incineration, only a small amount of ashes remained, principally consisting of oxide of iron and lime. Concentrated sulphuric acid dissolved it, with a red color; nitric acid oxidized it, at moderate heat, to a yellow mass, in which picric acid was recognized.

"It has occurred to me," says our correspondent, "that this red color may be due to the coloring principle of the *krameria triandra*, the plant yielding the rhatany extract, which occurs in tropical climates in great abundance. In comparing the rhatany extract with the *fuente de sangre*, I was struck with the identity of all the reactions, so that I became convinced that this spring is a more or less decomposed aqueous extract of the roots of the above named tree. These roots contain a nitrogenous body: and Wittstein, of Munich, succeeded first in separating it in fine colorless needles, showing almost all reactions for tyrosine. Ruge, in 1862, determined its formula to be $C_{10} H_{13} NO_3$; he calls it rhatanine. It is analogous to tyrosene and yields, by oxidation, dark red products. This theory accounts for the presence of ammonia as well as for the red color of the *fuente de sangre*."

DISTINGUISHING FIBERS IN MIXED GOODS.

A correspondent writes to know if there is any way in which to distinguish vegetable fibers such as cotton, flax, tow or jute, in woolen and silk goods. In addition to the information on this subject published on pages 131 and 150 of our current volume, we give a method somewhat different to any we have yet published, proposed by Professor Emil Kopp: If the goods be boiled in a ten per cent caustic soda lye, wool and silk are dissolved, but the vegetable fiber will not be acted upon. The addition of sugar of lead to the alkaline solution will occasion a black precipitate if wool be present. The undissolved fiber ought to be bleached in chlorine water if it is colored, and it can then be decomposed by cupro-ammonia, which dissolves cellulose. Where the goods are highly colored, it is well to treat them with a mixture of 2 volumes concentrated oil of vitriol and 1 volume nitric acid. Wool, silk, and coloring matter will be destroyed, while the cellulose will be converted into gun cotton and can be recognized by its explosive properties. When the goods are white, a solution of fuchsin can be used as a test, which dyes silk and wool, but not vegetable fiber. The sizing must be removed before applying this test, which is best accomplished by washing in a weak solution of carbonate of soda and in soap, and applying the fuchsin mixed hot with some carbonate of soda. To detect wool in silk, a solution of oxide of lead in caustic soda can be employed, which turns woolen goods black owing to the sulphur of the wool combining with the lead. Silk in wool is shown by its solubility in a cold solution of cupro-ammonia—from this solution acids precipitate the silk in *flocculi*. Wool is only soluble in cupro-ammonia by aid of heat. Concentrated acids, such as sulphuric, nitric, or preferably hydrochloric, act in the cold upon silk but not on wool. The solvent properties of cupro-ammonia, Schweitzer's test, make it one of the most useful reagents we have in the laboratory. It is prepared by suspending strips of copper in concentrated ammonia in a large flask, lightly corked, and occasionally shaking so as to bring the metal in contact with the oxygen of the air. A good plan is to transfer the contents from one flask to another. By degrees a tolerably concentrated solution of oxide of copper in ammonia is obtained, which is one of the best solvents of cellulose known.

SPRING WATER IN THE VICINITY OF CEMETERIES.

The *Annales de la Société de Gand* contain a very interesting analysis by Lefort of the water of St. Didier, which illustrates the influence of cemeteries on the spring water around them. The water had a sweetish taste and produced no desire for vomiting, but left a disagreeable fetid taste on the tongue. A gray, thick sediment remained after evaporation, which turned, by continued heating, to a dark brown, emitting an empyreumatic smell. One part of this residue was treated with diluted muriatic acid, producing carbonic acid and a strong smell of glue; another part was treated with hydrate of lime and showed a considerable amount of ammoniacal salt. The presence of organic substances in this water shows that, even at a distance of 300 feet, water may tainted by a cemetery. No cemetery should be laid out unless it is clearly shown that no filtration of water from the burial ground can take place into that used for human consumption. It is also a necessary sanitary measure to draw off all the water in the vicinity of established cemeteries or other places used for the interment of animal bodies, and it is matter of hygienic importance to analyze from time to time the water used in the neighborhood for drinking, so that any substances dissolved therein, which may be deleterious to health, may be clearly discovered. This is especially necessary in localities with but a limited supply of water.

FILTERING STRONG ACIDS.

James St. Clair Gray recommends the use of a bundle of spun glass threads in a funnel, with glass powder spread over it. Before use, this filter can be washed with hot water, dried, and then washed with pure acid.

PARCHMENT SOLUTION.

A Berlin chemist (De Souwageon) has introduced a solution of gutta percha in ether for the purpose of giving maps, pictures, globes, etc., a clear, thin coating for protecting them against dust and dirt. Objects so covered can easily be cleaned by the application of a moistened rag. Drawings executed with charcoal, pencil, or crayon may be permanently fixed by the application of the dilute solution to their surfaces. The ether evaporates, leaving the gutta percha in a thin but sufficiently protecting covering on the drawings.

Burnt Boiler Plates.

A correspondent, J. H. T., of Ky., states that, in his opinion, a frequent cause of burnt boiler plates is the too close proximity of flues to the shell of the boiler, owing generally to the flues being too large. Thus there is but little water between the flues and the shell, and evaporation cannot take place, in so narrow limits, rapidly enough to prevent burning the plates. Owners of boilers thus troubled should reduce the diameters of their flues.

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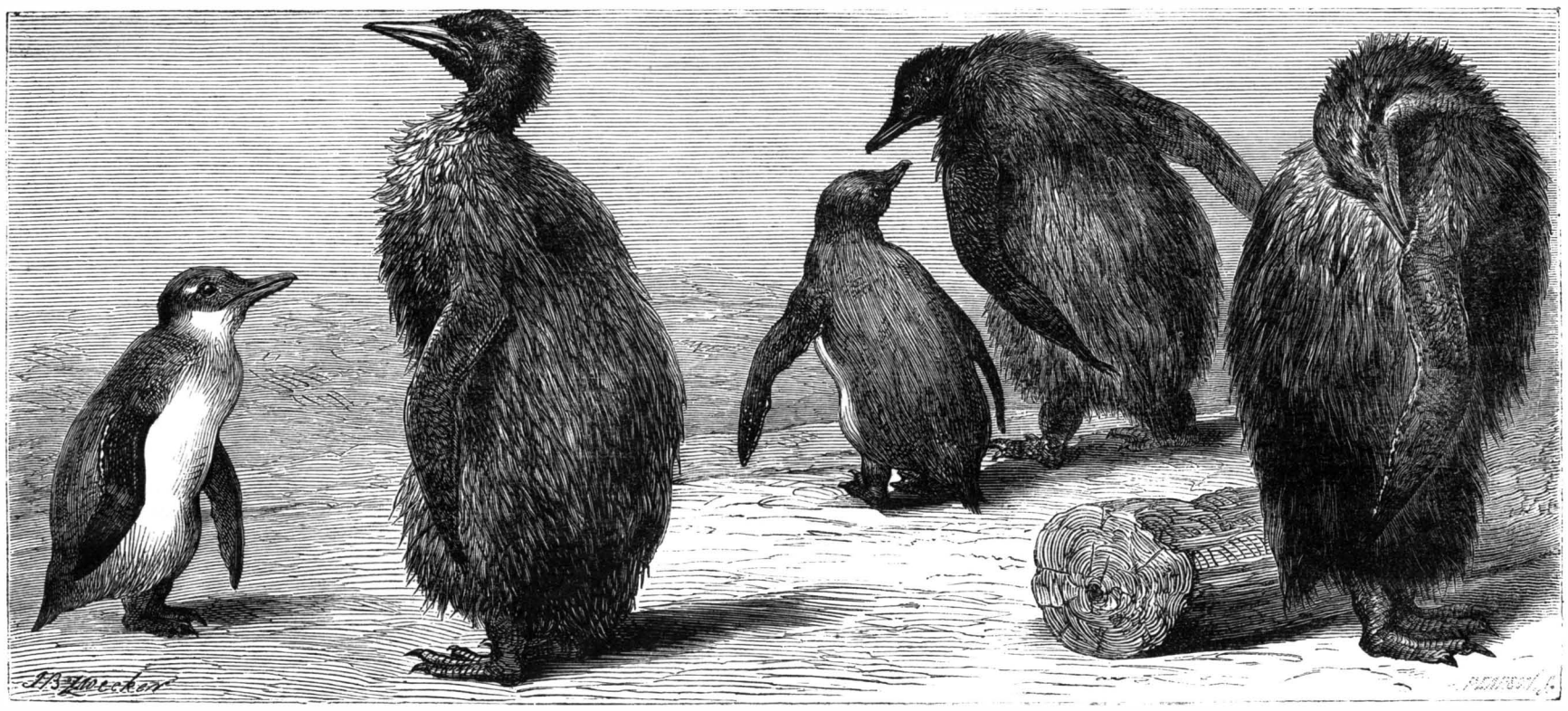
THE KING PENGUIN AND THE AUSTRALIAN BUSTARD.

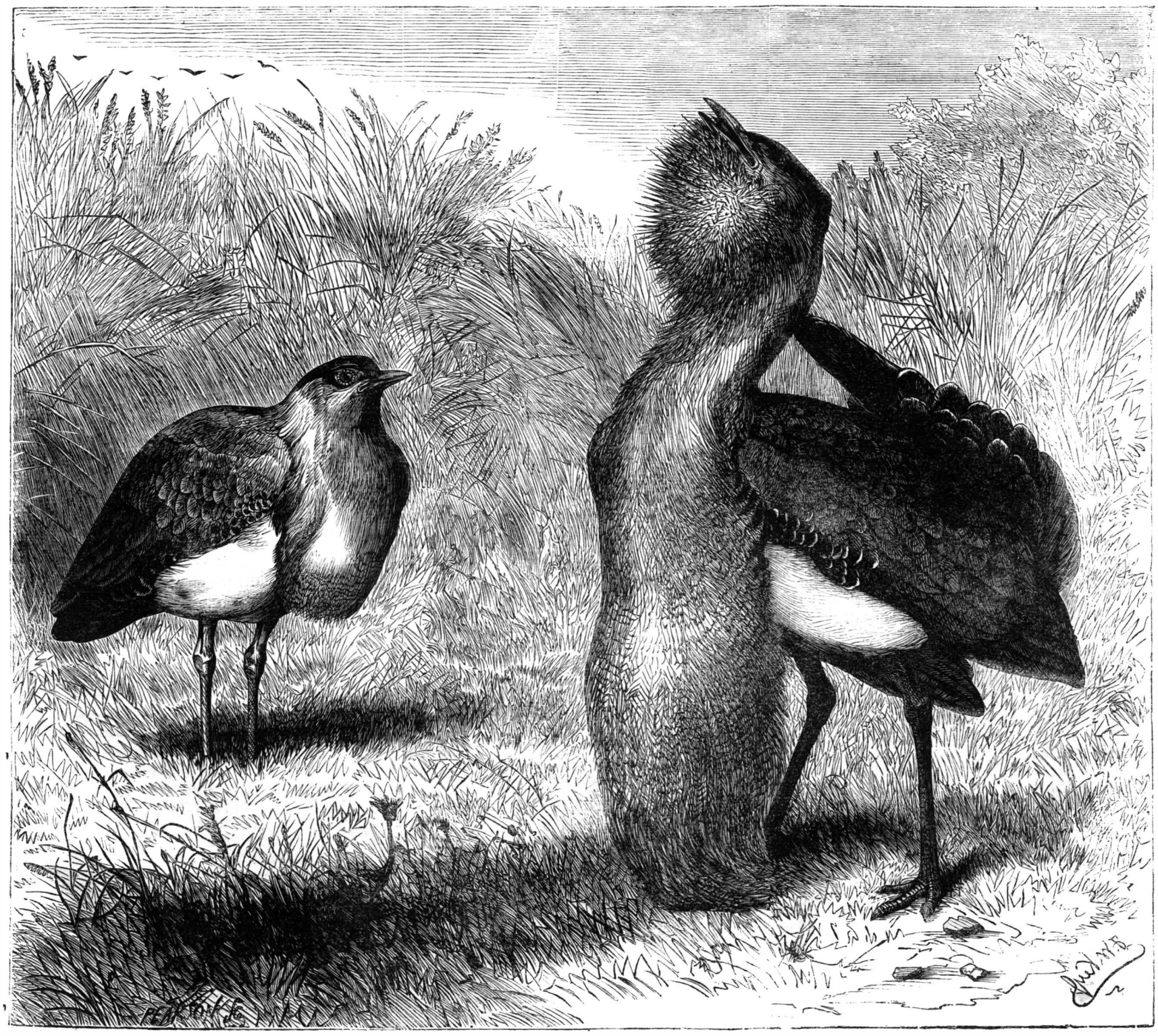
The birds invariably form the most interesting class of specimens in any zoölogical collection. As they are, almost without exception, perfectly harmless, and possess the friendly disposition which generally belongs to the weaker creatures, they are universal favorites with the juveniles; and their plumage is as strangely varied as their voices, ranging from the plain russet brown and liquid melody of the nightingale to the brilliant colors and shrill scream of the macaw. We give herewith representations of two recent additions to the collection of the Zoölogical Society of London, kept in the well known gardens at the north end of Regent's Park.

The King Penguins were brought from the Falkland islands, and are shown in the engraving in company with two penguins from the Cape of Good Hope. The former are young birds, only 30 inches in hight, and are as yet covered with a downy fur which will, in time, give place to feathers. The two species are friendly to each other, the nimble little Cape birds, being fond of running about, an exercise in which the big infants are not capable of joining to any great extent.

The Australian bustards are of the order *grallæ*, or waders, of the genus *gallinaceæ*. They have long necks and legs, but their wings are short, and they use them, as ostriches use theirs, more as assistants in running than for purposes of flight. They are singularly timid birds; they live on grain, herbs, or worms, and never perch. The male bird has, as is the case with most other birds, the more luxuriant plumage, and possesses the additional distinction of a pouch in the upper part of the neck, which it inflates when it desires to attract attention, as the peacock spreads his tail. The



THE KING PENGUIN



THE AUSTRALIAN BUSTARD.

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neck swells and the feathers droop, the tail is shot upwards and bent over the back; the pouch swings as the bird waddles rather than walks about. The bird has a habit of making this display chiefly in the mornings and evenings during May and June of each year.

[Engineering.]

PHOSPHOR-BRONZE TWEERS.

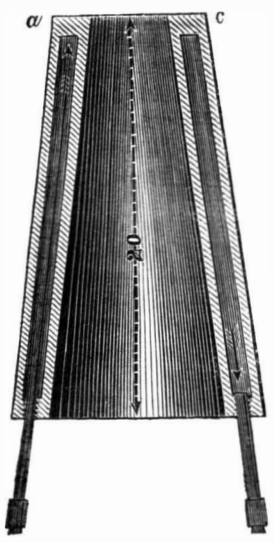
Every practical blast furnace engineer knows the inconvenience, labor, and often seriously disadvantageous consequences which are connected with the removing of a damaged water tweer. For the purpose of obtaining a satisfactory form of tweer, I have, since 1859, carried out at the Neusser Iron Works a series of experiments with variously constructed water tweers. The tweers mostly used in England, and made of helical iron tubes, either placed simply in loam or, as is more usual, surrounded by cast iron, I found to give the least satisfactory results. These heavy and unmanageable lumps cannot resist the contact with the fluid iron and iron-containing slag; they are soon worn off by any contact with the fluid mass of metal, become leaky, and occasion accumulations which become so intimately connected with the mouths of the tweers that often great portions of the wall of the hearth have to be broken away in order to get them out.

I next tried wrought iron tweers with welded seams. These gave better results, but they also could not withstand the contact with the molten metal, and became united to the latter, though the tweers were not so easily damaged as those of the first mentioned construction.

When these tweers had to be removed, the same difficulties were met with as with those previously described. It is also difficult to ascertain beforehand the perfect soundness of the weld. Some of these tweers were often not many days in the furnace when leaky seams were discovered at the mouth, thus necessitating their being taken out, and this would happen notwithstanding the perfectly satisfactory testing of the tweers with a water pressure of from 10 to 12 atmospheres. The best mode of testing such tweers consists in filling them with water and, after driving wooden plugs into the inlet and exhaust openings, placing the tweers perpendicularly with the mouth upon the fire, until the wooden plugs are thrown out by the pressure of steam. If the tweer withstand this test without leaking, the welded seams are then generally trustworthy.

I obtained better and, in fact, thoroughly good results with bronze tweers, and have used them for ten years. The bronze tweers form less easily a connection with the fluid metal than the iron ones, and withstand the contact with the molten iron very well. Of course they sometimes get cracked; but in that case they are easily taken out, because the bronze, even if connected with the products of the furnace, may always be removed from them with a small amount of force. We may presume that such a tweers, will sustain perhaps ten times the exposure to contact with metal and fluid slag that would be endured by an iron tweer. I use tweers of the pattern shown in the annexed sketch, and have found it the best after many experiments. If made too long and the fire is allowed without consideration to extend, the walls of the hearth suffer; if kept short, say, twenty inches, it becomes necessary, with the increasing action of the fire, to renew the ramming in, and the walls of the furnace are preserved. These tweers are not easily damaged if well made, and if the precaution is taken to conduct the current of water (supplied through a ¾ inch pipe with at least a pressure of from 30 feet to 40 feet, and more if possible) directly to the front of the tweer, in order to prevent incrustation, though that end is not entirely obtained by this arrangement. Such a tweer has to be removed every six months, in order to get the incrustation out either by means of hammering, or by drying the tweer and making it slightly red hot at the mouth, in which state cold water is poured into it, when the incrustation becomes converted to dust, and is washed away by the water; the tweer may also be boiled with half diluted hydrochloric acid.

The water is introduced through ¾ inch wrought iron tubes (gas pipes) screwed into the bottom of the tweer, as shown in the annexed sketch, which represents a fastening that I consider to be the best.



Besides the advantages mentioned above, the bronze tweers are more durable, are more easily manageable, and are more uniformly circular than the iron tweers, which latter property is always an advantage for the furnace. Moreover, if more expensive in their application, they are, nevertheless, much cheaper in their use than the other tweers, as the founder will always accept the old metal in lieu of part payment.

The bronze tweers are therefore certainly the cheapest in their application, but it appears to be no easy matter to have them cast, as it is not every brassfounder who can do it satisfactorily, success depending much upon the selection of the metal and the skill of the founder; in fact the casting of tweers is an art, like that of casting bells. I have found that intelligent brassfounders could not succeed, and even large establishments, with all their resources, have tried in vain to obtain satisfactory results. But even the bronze tweers were not perfect; they often became cracked in a manner quite inexplicable, and, if they came into contact with the bed of metal from below, would tear or melt. A few years ago my attention was called to the so-called phosphor-bronze of Montefiore Levy, and everything said about it in private and public reports, and the results obtained from the trials with this metal for artillery purposes, about which a great deal has also been published in England, convinced me that the properties of this metal must offer the same advantages for tweers as for guns. It appeared, in fact, to offer greatly increased toughness and density, and, therefore, great resistance against change of temperature and the influence of molten masses. I ordered, consequently, several tweers of this metal, according to exactly the same pattern as that for the ordinary bronze tweers. These tweers have given me the fullest satisfaction; they have the advantage of being more tough than the tweers of ordinary bronze, and in cases where other tweers would certainly have burst, they sustained the shock without any damage being done to them. I ascertained further that this metal does not take up so readily or so firmly the incrustations produced by the contact with the water, and, what is of great importance, the oxidation of phosphor-bronze is much more slow than that of the ordinary bronze. I have found after a year's use that a tweer of phosphor-bronze, when wiped with a piece of rag, appears quite smooth, and has a bright metallic surface, and that it had remained entirely without incrustation. The extra preliminary expense for phosphor bronze appears almost insignificant in view of the advantages mentioned above, and, the expense of re-casting this metal being the same as for ordinary bronze, the higher value is in the metal itself.

ELASTIC WASHER.

We present herewith perspective and sectional views of a new elastic washer in which the packing is so inclosed as to be protected from injury by reason of the torsional action of the nut.

Fig. 1

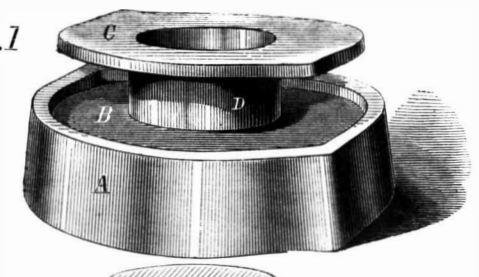
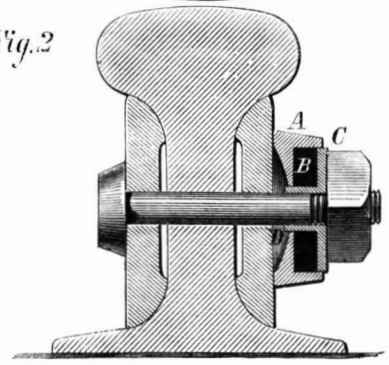


Fig. 2



A is the flanged disk or socket, B the packing of rubber or other suitable material, and C the metallic follower or face plate. In each of these is formed a central aperture of suitable size to receive the bolt. In one piece with the face plate, C, is made a tube, D, so as to form a prolongation of the orifice. This tube passes through the packing and the base of the flanged disk, A, which is arched to leave sufficient space for the tube to work freely without coming in contact with the fish plate of the rail, as shown, or other bearing surface of the washer. The packing and follower move freely within the socket. The latter with the follower is made in oval form so as to prevent the movement of the socket upon the packing.

It is clear from the above that, when the nut is screwed home, it will follow the face plate, C, into the socket, and thus project a correspondingly less distance beyond the latter than it otherwise would. It is consequently less exposed to injury. The socket has incidentally also a broader bearing surface, and hence will not turn with the nut when made smooth or when oil or other lubricant has been accidentally applied to it.

The inventor claims that a shorter screw bolt may be used with safety in connection with this washer than with others of like thickness. The device appears strongly constructed and of simple though efficient form. It is doubtless durable, and, we should judge, not costly to manufacture.

Patented through the Scientific American Patent Agency, July 2, 1872. For further particulars address the patentee, Mr. Caspar Dittman, Leacock P. O., Lancaster Co., Pa.

Hot Air Furnaces.

It has been proved by careful experiments, in this country and in England and France, that carbonic oxide and carbonic acid gases will freely pass through cast iron when under the influence of heat. This metal should therefore be discarded in the construction of hot air furnaces, and wrought iron substituted. The latter does not permit these deadly gases to pass through.

FRICTION IN ROLLING MILLS.—In a large rolling mill, calculation shows that about 40 per cent of the power is absorbed in friction. It is evident that great economies may be effected in this direction.

Xylol.

We read the following in a contemporary:

"BALTIMORE, MD., January 15, 1872.

"*The Superintendent of Police, St. Louis, Mo.:*

"SIR: I would most respectfully call your attention to the new medical compound known as 'xylol,' which is now being used in this city for purposes of robbing and murder.

"The mode of application is by mixing it with the feathers in a pillow; and when the warmth of the head is applied to it, it gives off vapor similar in effect to the fumes of charcoal, and the person using it is found dead in the morning, which gives the monsters who apply the drug ample opportunity to possess themselves of the property of their victims and otherwise dispose of their remains.

"The drug was tried upon myself here some time ago by a German Jew, who invited me to stop in his house. I escaped his foul designs, and obtained a knowledge of his intentions and manner of proceeding by trifling circumstances, the details of which I will not weary you with.

"But as I had lately read accounts of several persons being missing in this and other cities, I felt in duty bound to investigate the matter for the benefit of society at large. Consequently I have devoted my leisure hours to it for the last two years, and have now acquired a perfect knowledge of the drug used; and I lose no time in communicating its name to you, that you may cause the officers under your control to put themselves in communication with the druggists, and keep a system of surveillance over those who purchase it. Hoping that you will also cause a notice of the hidden qualities of the drug to be sent to the police authorities in all the principal cities in the State of Missouri, I remain, Sir, yours very respectfully, M. WALSHE, M. D."

REMARKS BY THE EDITOR.—Xylol, called also xylene and di-methyl benzole, is one of the coal tar products, and is analogous to benzole and toluol. It was first found in wood spirit by Cahours, who gave it its name from the Greek word *xulon*, wood. The series is: Benzole, $C_6 H_6$; toluol, $C_7 H_8$; xylol, $C_8 H_{10}$. Xylol can be prepared from coal naphtha by fractional distillation. As soon as a product is obtained having a specific gravity of 0·866 and a boiling point of 140°C., it is mixed with sulphuric acid, which dissolves the xylol and yields xylol-sulphuric acid. The acid product is decomposed by dry distillation and further purified. It is colorless, has a faint odor resembling benzole, but differs from the latter in boiling point and specific gravity. A good deal was said about it at one time as a remedy for small pox. Ten or fifteen drops a day were prescribed as a precaution in addition to vaccination. The theory was that it destroyed the poison in the blood. Raspberry sirup was given to mask the disagreeable taste, particularly when prescribed for children. The dose is three to five drops for children and ten to fifteen drops for adults, but it should not be taken without the advice of a physician. The paragraph copied above from the St. Louis *Democrat* is decidedly of a sensational character. Any one with the smell of benzole, ether or chloroform in his pillow would not be likely to lay down to pleasant dreams, but would open wide the casement, and if he were staying at a hotel would loudly call for another room. A somewhat similar story went the rounds of the papers in reference to the hydrate of chloral, which it was said was administered for the commission of crime. It is not probable that any of these re-agents are employed for such purposes, but no harm can result from the publication of them in order to put all persons on their guard.

SECTIONAL LIFE BOAT.

Mr. Christopher Pond, of Philadelphia, Pa., is the inventor of the novel form of life boat represented in our illustrations. The device consists in two metal tubes made in sections and screwed together to form two continuous floats. each section constituting a water-tight compartment. At proper distances, at each side of the center of the floats, rise standards which are coupled by stretchers or bars. The latter are hollow, fit over the standards, as shown in the sectional view, Fig. 2, and serve to retain the floats in position, preventing them from rolling independent of each other. To the stretchers are attached straps, to which is secured a seat made of netting or other suitable material. When it is desired to remove the boat from the water for storage or transportation, it may be readily taken apart and packed in compact form.

Fig. 1

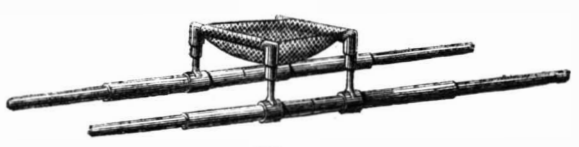
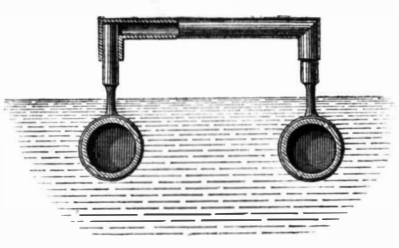


Fig. 2



If the occupant of the boat is thrown out by any accident, he may grasp the floats and buoy himself thereon, as the latter will not sink, even if the boat is on its side or completely overturned.

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Correspondence.

The Ignition of Wood by Superheated Steam.

To the Editor of the Scientific American:

In your issue under date of February 8, I notice an article on the ignition of wood by the heat of steam; and if I understand your remarks correctly, you take the ground that the heat from steam at any ordinary pressure will not ignite wood. The inference would be that wooden supports for steam pipes, used in heating buildings, would be safe. Perhaps you are right; but if such is your opinion, I must differ from you. I formerly held the same opinion, and I will state what it was that led me to change it.

A few years since I worked in a factory which was heated by steam pipes, running round the rooms, and passing through the partition walls from one room to another. The pipes had been laid several years, when a fire occurred near by, which brought the insurance officers to the neighborhood and caused them to make an examination of the condition of other buildings and of the factory in which I worked. The result was all the wooden supports were ordered to be removed, and the passages through the partition walls to be made larger, and the pipes kept from contact with wood. In making the changes, I found that, in some places where the pipes came in contact with wood, especially in positions where no air could circulate, the wood was in some instances burnt to charcoal, particularly the soft pine, and in one instance a chestnut stick was similarly affected. We removed the pipes from contact with wood, in all places as we supposed, but there was one place, through a partition wall, that was overlooked. Sometime after, I think it was the next winter, we were alarmed at the smell of scorching wood; and, upon making search, we found the place which I have said was overlooked, and the wood was smoking. Enough smoke had been made to give a blue look to the air in the passage adjoining. I found the wood next the pipe for one eighth or one quarter of an inch turned to charcoal; and it was turned brown for a considerably greater depth. The charcoal made by such low temperature long continued is very loose and becomes dust by slight rubbing with the finger. I have no doubt that, if the place had not been attended to, it would at some time, and perhaps that very morning, have originated a fire. The place was about thirty feet from the boiler, an upright tubular that carried eighty pounds of steam at the highest, but not usually over sixty pounds.

Is there anything unreasonable in the supposition that charcoal, made at a very low temperature and finely divided, will ignite by the heat imparted by a steam pipe carrying eighty pounds of steam, if in long continued contact? In your issue of January 25, I find a table which shows that charcoal made at a low temperature will ignite more easily than that made at a high temperature. Observation of the facts which I have stated above led me to the conclusion that wood may be ignited by the heat of steam pipes carrying a pressure of not more than eighty pounds to the square inch. Certain I am that charcoal may be produced by such a heat, and by still less, even that from sixty pounds of steam; but it takes several years to do it, for wood, in another instance, that had been in contact only one year was scarcely brown, while that which had been exposed five or six years was in some cases turned to charcoal. I will say that, in the cases I have mentioned, I think there could have been no oil to play a part. M. M.

Franklin, Mass.

The Ignition of Wood by Superheated Steam.

To the Editor of the Scientific American:

As there appears to exist considerable doubt as to the possibility of superheated steam igniting wood, I give two facts which will speak for themselves:

During the early part of the spring of 1872, I had occasion to take indicator diagrams from a 20 by 48 Corliss engine, of which I have charge. From the ceiling I suspended a lever of white pine 1¼ inches by 3 inches, and about 8 feet long, with an open slot in the lower end to receive a pin screwed in the crosshead; after use, I raised the lever up over and let it rest on the bare steam pipe. Finding from the diagrams that the engine was not doing work equivalent to the amount of fuel consumed, and that the boiler (of the Howard sectional style) was working great quantities of water over, I connected a superheater of 3 inch wrought iron pipe therewith, having also a 3 inch pipe from top of drum to main steam pipe, with valve to regulate any desired amount of saturated steam. One day, some two or three months after, I saw sparks and smoke coming from between the pipe and lever; on lifting it, I found a hole burnt in the edge of the wood conforming to the shape of the pipe, an inch deep and full of sparks. Steam in the boiler was at 100 pounds pressure. The same lever now lays in the same position as when I found it smoking, with the addition of felting underneath, saturated and superheated steam being mixed in equal quantities.

The second instance was brought on by the contact of a 1½ inches live steam pipe (superheated) with small blocks of black walnut, mingled with fine dry sawdust. The fire brought out the fire engines but did little damage, as the watchman put it out with a 1½ inch hose specially laid for such accidents, he being within twenty feet and looking toward the fire when it broke out. I would add that the stop valve, although closed, leaked badly all night at the time of the fire, and now every morning, when it is opened, we get a number of electric sparks from the neck of the valve.

I hope you will give this space in your valuable journal, that it may be the means of inducing others having charge of steam and steam boilers to keep all easily inflammable matter from live steam pipes. E. R. DINGLEY.

New York city.

The Million Dollar Telescope.

To the Editor of the Scientific American:

In regard to the big telescope, you truly say that "some of our correspondents are determined to push this matter." Let me propose one or two ideas to serve as a basis for a company.

Let the company be known as the American Telescope Company, the capital stock to consist of 100,000 shares of $10 each. A board of 25 directors should be appointed to manage the affairs of the company, and should consist of five eminent astronomers, five eminent mathematicians, five eminent mechanics, selecting those especially interested in this class of work, and five eminent public benefactors, such as Messrs. Peter Cooper, Cornell, and others, and five eminent business men, a portion being manufacturers who, being familiar with the details of great enterprises shall, with the preceding five, constitute a business committee to push the thing along. These may elect a President and other officers.

Immediately establish a bureau of information, and set about collecting all that is known of telescopes or similar instruments. Let notice be given that any communications relative to the subject as well as models and specimens will be received and placed on file. Also let a suitable compensation be offered for a design for mechanism for mounting and operating the instrument. These will naturally call in numbers of communications from which, at intervals, a digest may be prepared and published (in the SCIENTIFIC AMERICAN, of course, Mr. Editor.)

Should any novel plans be presented, the directors may cause experiments to be instituted to test them; but no compensation shall be given to the designer unless his plan is adopted, and then only his actual expenses; but he shall, if his plan is adopted, have precedence over others in looking through the instrument, at times when it is open to the public. Upon the organization of the company, let a prospectus be prepared and sent to all colleges and libraries throughout the land, setting forth the purposes and plans of the company and soliciting subscriptions and donations, and also sent to the local press of the country with a request that they will give extended notice of it.

And now, that the enterprise may be speedily inaugurated, let us, with your permission, nominate you a committee to receive and place on file the names of all who will send to you and agree to attend a meeting, for organization, to be held in New York city at some time during the present year. When a sufficient number have responded, let a call be published, time and place being named, and a meeting held that will do honor to a subject of such great importance. The achievement will make America famous above all the earth.

F. H. R.

The Million Dollar Telescope.

To the Editor of the Scientific American:

I am glad to see the subject of the million dollar telescope agitated by you and your correspondents; and whilst I believe that the government has appropriated many millions for far less worthy purposes, I am opposed to its paying for this instrument. I prefer private subscription, and although I am hardly able to make a living, I am willing to pay something for this purpose.

Could not the governor of each State call for voluntary subscriptions, to be collected through some collecting officer already on duty, without commission for collecting? The money should be paid into the State treasury, to await the completion of the instrument, or be disbursed to the contracting party upon such terms as all the governors might settle during the building of the instrument, or after its completion. The amount of such subscriptions, or the receipt for the same, should stand good for so much State taxes or be refunded should the instrument not be completed.

Should a subscription be started and the public be satisfied that it would be honestly appropriated towards the building of the telescope, I think the amount would be quickly raised. When the instrument should be furnished, Congress would cheerfully build a house and have it mounted. All who subscribe should have the privilege of using it, if indeed it should not be open to the public.

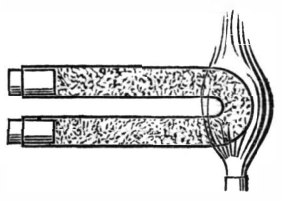
Let this subject be discussed; I think the "times are ripe" for such an undertaking. Let the whole world be called on for the largest glass that art can make. Dispose of this letter as you like, but agitate the subject. J. A. C.

Nashville, Tenn.

An Improvement in Bending Glass Tubes.

To the Editor of the Scientific American:

If the glass tube be filled with sand and each end stopped to prevent its escape, on heating over a Bunsen burner it will be found that the tube may be quite doubled if desired, a perfect curve being produced. In this way bends of any desired size may be accurately produced in tubes of any bore, without any previous skill in working glass. Obviously the principle depends on a uniform distribution, by the sand, of the pressure exerted. A similar plan is resorted to by metal workers in bending tubes of lead, etc. A. H. GALLATIN.



Retrograde or Direct Motion of the Sun.

To the Editor of the Scientific American:

As I have no instruments whereby to test and find out the fact, and as I have no better way of ascertaining the truth than through your scientific journal, will you publish the following?

In each of the astronomic books I have read, in speaking of precession, the author says, substantially, that a "vernal equinox day is shorter than a sidereal day by an amount equal to one day in about 25,868 years." If that is true, my theory of solar retrograde motion is knocked on the head: for if the sun really moves retrogressively, as I believe and claim, then a vernal equinox day must be shorter than a sidereal day by an amount equal to one day in 25,868 days, and to one year in 25,868 years.

This last I believe to be the truth; for the equinox, and of course the whole seasons of the year, fall back on the ecliptic 50·25″ annually: a space which the earth takes 20 minutes and about 23 seconds of time to pass by. This 20 minutes and 23 seconds amounts to a whole year in less time than 25,868 years. So I conclude that a solar day is longer than a sidereal day by an amount equal to 20 minutes and 23 seconds less than one day every year; and that an equinoctial day is shorter than a sidereal day by one day in 25,868 days, or by one year in the same number of years. If I am correct, then the sun moves retrogressively as sure as light flows from him. If I am not correct, that is to say, if the time is one day instead of one year (as I say), then my theory is at an end. If I am correct, as doubtless I am, the sun annually carries the earth as it were back in her orbit 50·25″ or about 28,500 miles; and it requires the earth 20 minutes and about 23 seconds to pass through that space in her orbit.

This retrograde motion of the sun does not in the least interfere with the so called 18,200,000 years orbit of the sun and the 117,000,000 of other suns and solar systems, recognized by popular astronomy. To suppose that the movement of such a host of celestials represents the orbit of our sun is a poor astronomical idea. As well might we suppose the Gulf Stream to represent the orbit of all the fishes in it. The movement of such a host of celestials around *Alcyone* in direct movement towards *Hercules*, may be a "drift motion" in celestial space; and there may be many thousands of other suns besides our sun moving retrogressively, while the vast multitude is moving directly.

Gloucester, N. J. JOHN HEPBURN.

Water Supply for Fire Purposes.

To the Editor of the Scientific American:

New York city seems anxious to obtain a water supply for fire purposes that shall be both economical and practical. Binghamton was so once, and has been very successful in attaining the end desired. We have a constant supply of water for fire and domestic purposes, with a head changeable at will from 1 to 120 feet pressure, under the control of an automatic governor located at the pump house, regulated by the opening and closing of a hydrant; and all this without either a reservoir or stand pipe, both of which are needless as well as expensive, as has been demonstrated over and over again in our city.

Our works have cost us about $150,000; we have over twenty miles of service pipes, and have nearly done away with the old fire department, depending upon the hose companies for the suppression of fires. All that is needed is to attach the hose to a hydrant, turn on the water, and, in three minutes time, there is a full head at every hydrant in the city, which, if needed, can be confined to the immediate precincts of the fire.

The system is scientific and intensely practical. The power consists of suitable boilers and engines, located near the Susquehanna river. The water is forced directly into the main pipe, and distributed thence through the service pipes.

The pumps used are rotary, the inflow being without the thud that follows the stroke of a direct acting piston pump, thus relieving the pipes from the intermitting blows so destructive to pipes and joints. Our pipes are stovepipes (rolled iron with riveted joints) lined with the best water cement, and are very durable. The pressure is regulated at will, as stated before, by the demand made for water, and is under absolute control from this source. ALFRED C. POPE.

Binghamton, N. Y.

Why Boilers Explode.

To the Editor of the Scientific American:

From the number of explosions throughout the country during the past year, one would suppose the epizoötic had attacked the boilers. But I think that a majority of these explosions have been caused by negligence and incompetency. A short time since I stepped into a flouring mill here; and the first thing I heard was the lower gage cock open and no water. The proprietor informed me that the water had been down below the lower gage cock about one hour and a half. They had stopped the supply pump for repairs, and kept the mill running. When I went in the engine room, the pressure gage showed eighty pounds and the furnace was full of wood and coal. The plates of every ring of the boiler were sprung out of shape; the fire line of this boiler was at the second gage cock. I remarked to the proprietor that I would not like to have such a hot fire and then to pump cold water into the boiler. His answer was: "It doesn't hurt it." This man has a negro to attend the engine; and as he can stop and start, he is considered entirely competent to take charge. Last summer I saw two engines ready to go out on a threshing tour; both had their crown sheets badly burnt, and on one the crown sheet had gone down six inches; and some of the stays were broken in both. Yet both were pronounced

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perfectly safe. And now I contend that these boilers are not safe, because they have been so weakened that they are liable to explode under a moderate head of steam and "plenty of water," which latter is generally the verdict in most of these accidents. Perhaps it is true at the time, but nothing is said about the previous treatment which weakens the boiler; and then the maker is blamed. ENGINEER.

Extinguishing Fires by Steam.

To the Editor of the Scientific American:

The extinguishing of fires by steam has been mentioned in your paper as a new German discovery. I do not believe it to be new, as I have before seen propositions to admit steam into the rooms of burning buildings to extinguish flame; and if it could be confined, it would be very effectual. As an evidence of its effectiveness under very trying circumstances, I will give a case which occurred in my own experience:

While engaged, during the year 1859, in making oil from cannel coal in the Kanawha Valley, at Charleston, W. V., a cast iron still cracked, while nearly filled with oil, and a small stream of the heated oil fell on the fire below it. This was probably caused by the watchman and fireman getting asleep, letting the fire go down, and then, on awaking, endeavoring to make up the amount of oil that should have come over by heavier firing; and as the bottom of the still was very thick, it was cracked by the unequal expansion. Sleeping in my office, not far distant, I heard the alarm and hurried to the factory, accompanied by several of the workmen. An iron chimney, about 18 inches in diameter, was attached to this still, reaching about 12 to 15 feet above the roof. This chimney was white hot, and was pouring out an apparently solid flame, ten feet high, and large quantities of unconsumed soot were falling on the roof. On going in the building, I found the men throwing water under the still and on the blazing coke under it, but with no effect, as the oil kept the fire on the grate up; the burning oil was floating on the water which fell through. The fire was getting hotter, and there was great danger of the crack enlarging. I directed the men to close the doors of the furnaces as tight as possible to exclude the air, and then to attach a steam hose to the boiler and to fire it up higher at the same time. Luckily it was in the winter time, so we had to keep up some steam in the boiler to keep the pipes from freezing. We soon got up our steam, put the nozzle of the hose under the still door, and let on all the steam we could. In less than five minutes the fire was out, and the chimney cooled off; and, strange to say, the still did not leak any more. The bottom, however, was taken out, as we did not dare to trust it any longer over the fire. This was a very narrow escape. The fire had got considerable head before the steam was applied, and one who has not seen such a fire can hardly imagine its fierceness. Afterwards a crack occurred in another still, but the men, knowing how to manage it, applied steam at once and put it out without much trouble.

We also had a fire occur under a 2,000 gallon boiler-iron still, caused by the springing of a rivet. This occurred in the day time and was soon extinguished in the same manner.

Either of these fires would certainly have burnt up the factory if it had not been for the steam. So much for what I know about steam as a fire extinguisher. Let others give their experience under other circumstances and something of value may be elicited. C.

Dayton, O.

Bursting Strains of Boilers.

To the Editor of the Scientific American:

I would suggest the following plan for ascertaining the pressure necessary to burst a cylinder; it will put the matter at rest by a practical test.

Take a number of cylinders of uniform size, face the ends true and grind them to a fit, in the same way as we fit a set of rings to a piston. Have the heads separated, so as to admit water all around, and apply pressure by a force pump with a pressure gage attached, and register the result for several trials. Then try with a testing machine the same material, uniform in size with the first, but straight. This would give a fair comparative test with cast iron, for instance; it could be cheaply done by any one having the machinery, and to me would be more satisfactory than the theoretical demonstrations that have appeared from time to time.

I have believed in the "semi-circumference" theory from the first, but there may be some things brought to light which would give us a new idea.

The same result could be obtained with a system of levers bearing on each inch of the inner circumference of the ring, each lever weighted equally until the breaking strain was reached. E. BURROUGHS.

Auburn, N. Y.

T. Windle obtained a patent for a glass monument April 24, 1860, and the drawing furnished to the Patent Office with the application has the following inscription:

"Here lies Windle,
An inventor by trade,
This monument, you see,
Is an invention he made.

"A curious fact:
It has sometimes been said
That he made it while living,
But enjoys it while dead."

THE Mechanics' and Agricultural Association of Louisiana announces its seventh Grand State fair, to take place during seven days commencing April 23, 1873. Diplomas, medals and other prizes are offered for excellence in all branches of agriculture and handicrafts, domestic economy, and the fine arts.

ODD MATERIALS FOR PAPER MAKING.

It is said that far more money and time is annually wasted in prosecuting novel investigations, which in the end prove fruitless, than is expended in perfecting ideas which eventually become remunerative to the inventor and of benefit to the world. Probably, in no case is this assertion more true than in that of paper. Numerous patents have been procured for its manufacture from articles which have been experimented upon and thrown aside as useless years and sometimes centuries ago; and not only this, but expensive machinery has been devised and works established to carry out plans to which their originators would not have given a moment's consideration had they previously acquired a knowledge of what had already been done in the same line. Of late years, the utilization of waste or hitherto valueless products has attracted no small share of public attention, and the making of paper from such substances is becoming a favorite object for the researches of inventors. The brief *resumé* which we give below, of the efforts which have been made to put in use new material for paper stock, will therefore, we think, prove timely, both as pointing out how frequently the same invention is made by different parties, and also as suggesting, to those who may be interested in the subject, an idea of what has been heretofore accomplished.

The records of the United States Patent Office show that thirty-four patents have been granted during the present century for the use of special components in the manufacture of paper. In making the historical researches requisite to obtain the facts below given, we ourselves have found records of no less than forty-two different applications of wood, twenty-five of straw, and about a dozen each of leather and corn stalks, being introduced in the world since the invention of paper, and there is little doubt but that more extended investigation would materially increase these numbers.

The first vegetable material used was, probably, in prehistoric ages, the Egyptian papyrus. In the year 95 A. D., a Chinese mandarin is said to have discovered that paper could be made from the bark of trees and rags of silk and hemp. The first records of cotton paper show that it was used, in A. D. 900, for the papal bulls; and history tells us that, at intervals of a couple of hundred years apart thereafter, satin and linen papers were invented. In 1727, one Dr. Brueckmann published, in Germany, a work on stones, four copies of which were printed on leaves made from the fibers of asbestos. The use of this material has since been discovered (if we may use the term) twice. E. Maniere obtained, in 1854, a patent in England for asbestos paper, made by mixing the finely ground stone with rag pulp; and in 1871, a United States patent was granted covering the use of pulverized and ground asbestos. In 1765, a book appeared in Bavaria interleaved with specimens of paper made from hornets' nests, sawdust, moss, beech, willow, aspen, mulberry, clematis and pine, hop vines, peelings of grape vines, hemp, leaves of aloes and lilies of the valley, *arroche*, mothwort, *masse d'eau*, barley straw, cabbage stumps, thistle stalks, burdock, *conferva*, wheat straw, broom corn and Bavarian peat. The volume is entitled *Sammtliche Papierversuche*, and a copy, we believe, is to be found in the library of the Smithsonian Institute at Washington.

Paper was first made from "maize or Turkish wheat" in Italy, in 1772. Four years later, a book was published in France on paper obtained from bass wood, and it contained, like the work above mentioned, a large number of specimens. Such literary ventures must have met with popular favor, for, in 1786, still another volume appeared, this time printed on marshmallow paper, and containing samples made from nettles, hops, moss, reeds, 3 species of *confervæ*, couch grass, spindle tree, wayfaring tree, elm, lime, yellow willow, sallow willow, poplar, oak, burdock and coltsfoot. During the succeeding decade, patents were granted in England for paper made from leather cuttings, and also from sawdust, substances which have since been applied to the purpose, it would seem, in almost every conceivable manner. About as queer a material as could be well devised was that experimented upon by Labigarre, a Frenchman, during the first year of the present century. How he came to pitch upon such stuff as frog-spittle, it is difficult to imagine, unless, following the proverbial taste of his nationality, the idea flashed across his mind while hunting the batrachian delicacy. At all events, an old volume of the *Historical Magazine* says that he brought a bag of the substance to the paper mill at Catskill, N. Y., and had it made into a poor kind of paper; and that several persons became very much interested in it, and thought it a great discovery. Frog-spittle, by the way, is not the saliva of the frog, but the larvæ of an insect called the frog hopper, which are found on leaves enclosed in a kind of frothy liquid.

During the year 1800, paper was first successfully made from straw by Burton of London; in 1802, corn husks were again experimented upon, and a patent was granted in this country for their use. In Italy, paper was exhibited made of the *papus* of *seratula ervensis*, the *carduus nutans*, and the bark of the *erigerone* of Canada. In 1809, S. Green, of New London, Conn, obtained a patent for paper from sea weed. Eleven years after, the Danish government granted similar protection, for a term of five years, for a re-discovery of the same idea; and in 1828, another United States patent was taken out for the use of *ulva marina*, also a sea weed. In 1821, Janbeaurt of Marseilles devised a process of paper manufacture from licorice wood and hemp. In 1827, a Parisian inventor employed the same wood, mixed with pasteboard scraps. Within this decade, 1820–1830, we find processes for the employment of hop vines, moss, Mexican maguey, pine shavings, and the bullen of certain plants, decayed wood, an animal substance called "aporentype," hay, straw, and blue grass, besides several new methods of use of leather cuttings and corn stalks. In 1830, a coarse paper was made from the pine tree; and a journal called the *Crawford Messsenger*, in this country, was published on pages made of lime tree and aspen wood. Binders' boards were obtained from three kinds of salt grass. A French inventor—we suppose he was a cook—produced paper from asparagus, and a Swedish *confrère* followed his example by publishing a book the leaves of which were of paper obtained from the beet root. The latter invention has been repeated in this country, for we find a patent, dated 1857, in which the claim covers the employment of the refuse of all species of the beet genus, left after the sugar-making processes. Banana fiber was introduced in France first in 1845, and again in 1851, in connection with aloe and alfa fiber. In the former year, paper made from gutta percha attracted considerable attention in London. From 1850 to 1860, paper was produced from the dwarf pear tree of Algiers, a plant called the water broom, white pine shavings, southern cane, tow, horseradish leaves and fiber, vegetable remains of manure, the common hollyhock, undressed flax, wood shavings with bran, the "everlasting" plant or *gnaphale*, and plants of the *sparganium* family, marble dust (invented by a Glasgow stonecutter), Scotch ferns, bark of cotton stalks boiled with coal tar (an odd mixture), moss from the Lake Superior region (said to make excellent paper), and ivory, mixed with pulp.

Among the new materials introduced and in use during the next decade, we find "trash" or refuse of the sugar cane, swamp flag or cat tails, and sedge. Munsell's work on paper making says that, in 1867, the following substances were in actual employment: Manilla hemp, agave of Cuba, cultivated hemp, white hemp of Hayti, India hemp, acacia, cotton, fibers of aloes, jute, Spanish broom, hops, silk weed, down of date tree, flax, Chinese hemp, mallows, mulberry, Chinese nettle, New Zealand flax, esparto grass, linden, yucca, bamboo and cane.

It is related that, during the war, a New York merchant loaded a ship at Alexandria, Egypt, with mummies from the catacombs. On the arrival of the vessel in this country, the cargo was sold to a New England paper manufacturer, who reduced it to pulp, bones, bitumen and all. The fact was well announced by a clergyman in Boston, who, during the course of a sermon, astonished his congregation by remarking that the paper on which his discourse was written might once have been a portion of the Egyptian masters of the Israelites whose sojourn in that land he had just described. Unfortunately for the freshness of our story, this case is also a repetition. At the time, 1866, mummy paper was not new; for, ten years previously, a journal published in Syracuse, N. Y., greatly plumed itself on the circumstance that its issue of a certain date was made from the "ancient habitants of the land of the Pharaohs."

In 1869, *tule*, a product of the swamp lands of California, was tested and found to make a fair quality of paper. The *Annals of Scientific Discovery* for 1870 state that, during the preceding year, the following Asiatic plants were used for paper manufacture: the *tchuma* of Assam; the *ramee* of Malay—identical with the ramie plant now largely cultivated in the South—and the *jeetee*, *moorva* and pineapple of India.

During 1870–1871, patents were granted in this country for the use of wild and cultivated rice, potato pomace mixed with pulp, the vine and tuber of the potato, the bark of coniferous trees from which the resin has been extracted, stalks and fibers of cord grass, the plant *abutilon Avicennæ*, Indian rice or water oats and *agrostis litoralis*. In 1871, the *Mobile Register* was printed on paper made from okra. During the year lately closed, but two patents were obtained, one for the use of *tule*, and the other for that of plants of the *typha* family.

India Rubber Varnish.

There are many substances, among them nitrate of silver, upon which pure india rubber has no deleterious effect. Now, as india rubber dissolves with readiness in chloroform, sulphuric ether, bisulphide of carbon, and caoutchoucine, and as these solvents, when evaporated, leave the rubber firm and unaltered, it is evident that we have in a varnish so composed a means of applying a coating of pure rubber of any degree of thickness to the inside of any vessel, such as a photo bath composed of either ebonite, gutta percha, wood, or any other material of a similar description. From experiments made in this direction, using bisulphide of carbon as the solvent, a coating of rubber of a good quality has been obtained, which will answer most effectively for preventing all contact between the silver solution and the material of which the bath itself is formed.

THE DETROIT RIVER TUNNEL.—The small test or drainage tunnel, preliminary to the construction of the large railway tunnel between Canada and the United States, under the Detroit river at Detroit, Mich., is progressing. The drift has been carried out 1,200 feet from the American shore; the remaining portion from Canada has been carried only 400. It will, however, be completed and the junction made during the present year.

LENS TROUBLES.—If any photo reader be in trouble with a lens—whether a single one or a combination—that gives concentrated flare, let him extemporize a stop of blackened card board and try the effect of changing its position with respect to the back lens; for a position will probably be found at last in which the evil will be greatly diminished. As regards diffused flare, due precaution must be taken to have both the edges of the lenses, as well as every internal portion, properly coated with dead black varnish, black velvet being a most excellent material with which to line the inside of the tube.

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IMPROVED GRAIN CLEANER.

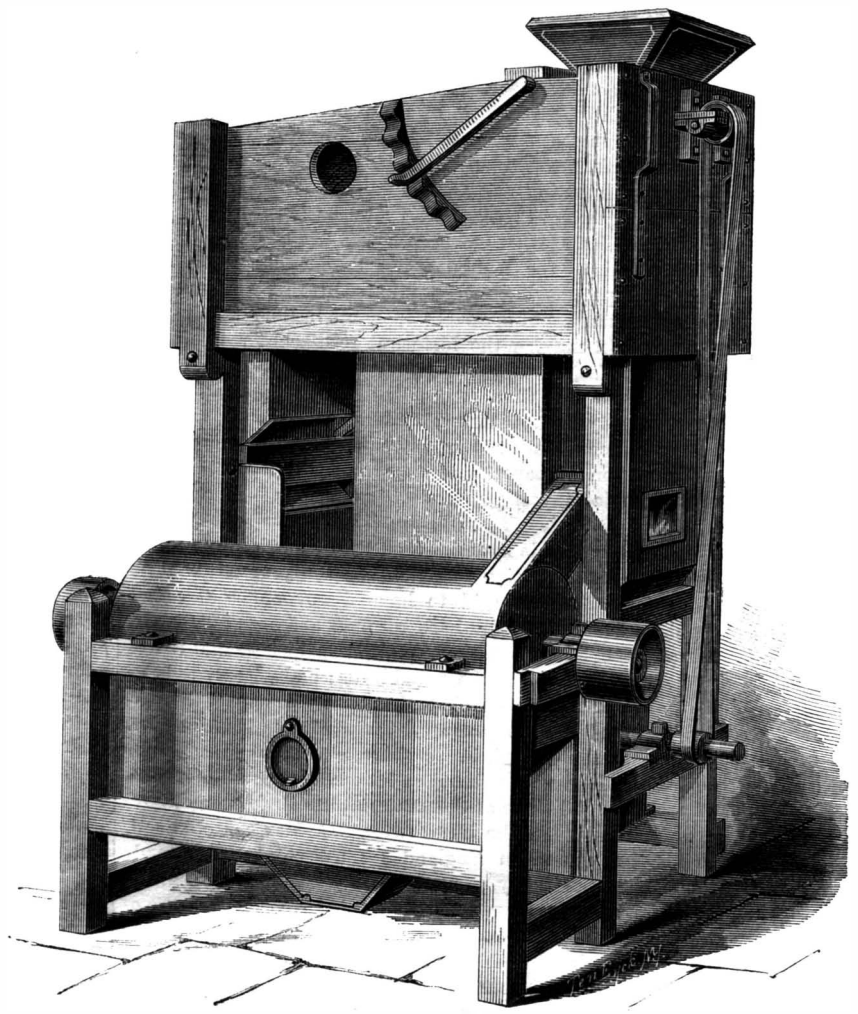
The invention herewith illustrated is known as the California Smutter and Separator, and serves to thoroughly cleanse grain, delivering it in proper condition to feed or grind.

A riddle made of perforated zinc, of dimensions proportionate to the size of the machine, is vibrated by a belt connected with the fan shaft, and serves to remove sticks, stones, long straws, etc., causing them to pass off at the end of the apparatus. The grain, after leaving this appliance, is conducted into an air chamber up which a current of air is drawn by the fan, blowing away smut balls, loose dirt, and similar refuse. The scouring cylinder into which the grain next passes is open at one end, and has a perforated case along the whole length of its under side. The fan draws in a current at the end of this receptacle and through the slots in the case, which carries off all adhesive dirt or smut as soon as loosened from the kernel, besides preventing any further contact of the wheat with the offal. After passing to the other extremity of the scouring cylinder the grain is thrown out of the top side into another air chamber, and again blown, this process completing the operation. The balance of the refuse passes down a lattice work in the receptacle, and escapes clean and free from dust from the hopper under the scourer, the dust being drawn through the lattice into the fan and passed out of the mill.

The machine has a valve in its rear side to graduate the current in the air chambers for heavy or light grain. Opening the valve lessens the suction, and closing it increases the same, thus taking out more cheat and small wheat. The fan case, wings, shafts, and pulleys are made of iron and can be removed and replaced without marring the machine. The scouring cylinder and its surrounding cases are made of heavy iron. The bearings to shafts are supplied with composition boxes and will, it is claimed, run constantly without heating. To afford further security against fire, the combustible material produced by the smut machine is entirely removed, so that the latter can be placed in an open room. By attaching a spout to the mouth of the fan case, the dirt can be conveyed to any convenient place of deposit.

It is claimed that this apparatus is much wider than others, and that the riddles or shoes are larger than usual, covering the entire top. The latter being constructed of perforated zinc instead of wire cloth are said to be much more durable and effective. The grain is conducted on a smooth surface, and evenly distributed in a thin sheet on the perforated part of the riddle by means of a feeder. From the time of its entering the machine the grain is spread over a wide surface, so that it is prevented from bunching, and better separation is insured. It varies in capacity according to size, from 15 to 100 bushels per hour, and requires but little attention when in operation.

For further information address the manufacturers, Messrs. M. Deal & Co., Bucyrus, Ohio.



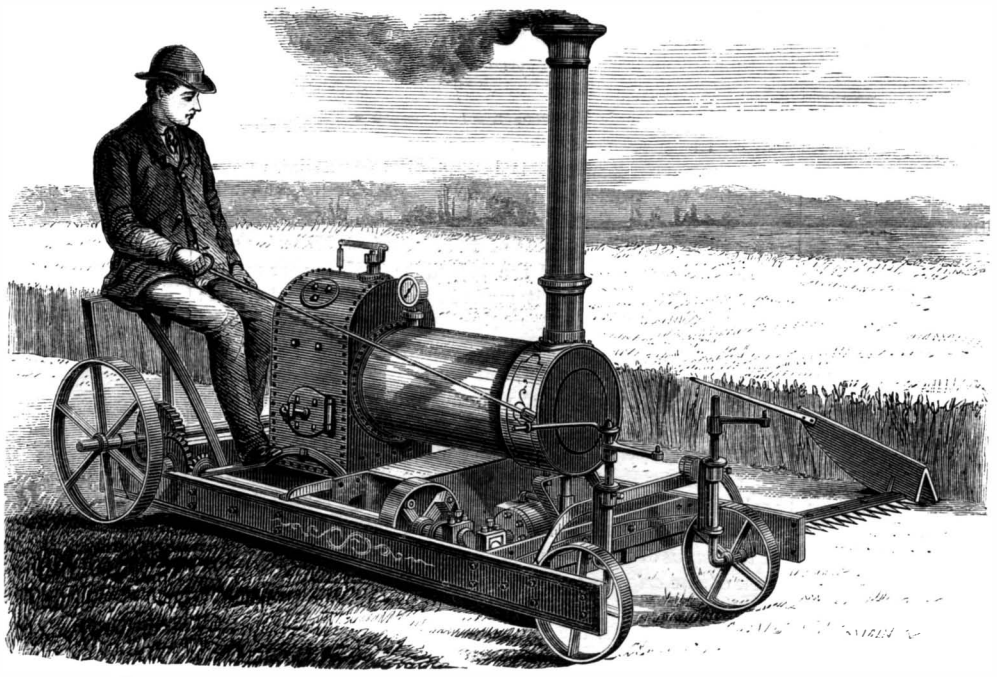
GRAIN CLEANER.

STEAM REAPER AND MOWER.

We are indebted to *Iron* for details relative to the new steam reaper and mower, recently patented by Mr. Edward Hayes, of London, England, which we illustrate herewith.

The implement consists of a boiler and steam engine, erected on a light wrought iron girder frame, the whole being carried on four wheels, of which the two hind wheels are utilized for propulsion and the two fore wheels for steerage and for carrying the cutting apparatus from off the ground. The boiler and engine are specially designed to develope a maximum of power with a minimum of weight; and the steam is used at a pressure of 120 lbs. to the square inch in the boiler. The piston speed is high, and is applied by suitable intervening mechanism to the double motions of actuating the cutter bar and propelling the implements by means of the driving wheels. With the object of not overloading the frame and machine, the storage room for fuel and water is very limited, and arrangements must be made for supplying the tender with these requisites at suitable localities. The machine ts worked by two hands, a man to steer and a boy to attend the fire.

This entirely novel invention is self-propelling, and altogether its weight does not exceed that of the combined reaper and mower in every day use. It will be recognized by practical men as a great gain, inasmuch as the horses are exposed to injury and laming in drawing ordinary machines, and this class of work is undoubtedly the most trying to them in the hot weather of harvest time. The farmer will, by the use of this apparatus, not only be enabled to reserve his horses for more advantageous labor, but he will have the means of acting promptly and expeditiously when occasion serves and requires, without reference to the antagonistic influences of weather or man, so far as it is humanly possible.



STEAM REAPER AND MOWER.

Remarkable Photographs from India.

At a recent meeting of the Society of Arts in London, a magic lantern display of transparencies from Captain Lyon's Indian negatives was made The photographic views include every temple of note in the great empire, and may be considered veritable works of art, upon the production of which much scientific labor and patience must have been bestowed. With the intense heat and glaring light, it is not always easy to obtain a satisfactory outdoor photograph in India; and the difficulty of procuring a good perspective in the long corridors of the temples—one of which exceeds seven hundred feet in length—is even greater. One of these temples, near Trichinopoly, is inhabited with 8,000 Brahmins, and is embellished with some of the most wonderful carving in granite that is to be seen. The Mundapum at Madura, which cost five million dollars to build, and of which the galleries are formed of carved pillars, each being solid rock of granite fifteen feet high and of the most exquisite workmanship, is represented with marvelous delicacy of outline, which conveys a very clear idea of the immense time, patience and skilled labor that must have been bestowed upon its erection. The great Juggernaut car, too, constructed out of several smaller ones and carved out of the finest ebony, was presented in several aspects. The Adavea Covill, a temple, the stone of which cannot be chiseled with our present tools: the Tanjore, with its magnificent tower, and the Bull of Shiva, weighing eighty tuns, and brought from a distance of 500 miles, no one knows by what means: tho seven pagodas, with their numerous, unintelligible, and unfinished carvings: and the fakirs, in all their strange and revolting habits: are represented with the clearness of reality and speak of a religious life so intense and universal, with such a wealth of idealism and apparently so little of the sublime, that the mind is lost in wonder. Although India is the most magnificent portion of the British Imperial possessions, comparatively little is known of it.

Dyeing Kid Gloves.

The dye solutions are brushed over a glove drawn smoothly over a wooden hand. In order to dye black, the glove is brushed after washing it with alcohol, dried and brushed with a decoction of logwood, left for ten minutes, and brushed over once more with logwood. After ten minutes the glove is dipped into a solution of sulphate of iron, and brushed afterwards with warm water. If the color is not dark enough, add a little fustic or decoction of quercitron in the logwood bath. In place of the sulphate of iron, the nitrate may be better employed. When the glove begins to dry, it is rubbed with a little Provence oil and talcum, laid between flannel and pressed. It is then rubbed again with oil and talcum, and drawn on a wooden hand. The glove must not get black on the inside, consequently none of the dye fluid should reach the inside of the glove. Brown is dyed by brushing on a decoction of fustic, red, and logwood, with a little alum. The quantities of dye stuff to be used are regulated according to the tints. For darkening the color a small quantity of solution of sulphate of iron is used. Morocco red is produced by brushing on a decoction of cochineal, to which a little salt of tin and oxalic acid is added. The tint is easily made darker by adding a little logwood. Gray is produced by brushing on a decoction of sumach, and subsequent treatment with a weak solution of sulphate of iron; greenish gray by the addition of fustic and logwood, also fustic and indigo carmine, to the decoction of sumach. The aniline colors all fix themselves without any further addition by brushing their solutions on the glove. In place of the brush a sponge may be used where it seems suitable In order to give black a pleasing bluish appearance, after the dyeing it may be washed with a little sal ammoniac. Should the seams in the gloves remain white after dyeing, they are coated with a paste in which a little fat is put.

The Spectrum of the Aurora and of the Zodiacal Light.

J. R. Capron has collected and compared the spectral results given by many of the principal observers, among whom are Schmidt, Barker, Proctor, Smyth, Zöllner, Clark, Lindsay, Herschel and Backhouse, and from these observations he deduces the following remarks, given in *Nature*:

1. That the full spectrum of the aurora consists of seven bright lines or bands and a faint diffused spectrum.

2. That two (perhaps three) of these lines are sharp and well defined, while the others are more or less nebulous.

3. That the red line (which seems to have been actually positioned by two observers only) is not found to coincide with the spectrum of any known substance or gas.

4. That the yellow green aurora line, and perhaps two other lines, according to one observer, coincide with lines of oxygen; while two lines, according to other observers, either fall very near to, or actually coincide with, F and G hydrogen, and that to this extent the axiom of Zöllner, that the spectrum of the aurora does not agree with any of the known spectra of the gases of our atmosphere, is challenged.

5. That Zöllner's theory, of the lines or bands in the blue being remains of a continuous spectrum broken up by dark absorption bands, is hardly supported by the other observers.

6. That the aurora spectrum is probably a mixed one, and that the red and yellow green lines are independent spectra; as also may possibly be the corona line and the continuous spectrum crossed with the fainter lines.

7. That the discrepancies in the observations recorded are considerable, and that all the lines (except, perhaps, Angström's), and specially the red one, require further examination to confirm their positions.

THE Westinghouse Pneumatic Car Brake has just been fitted upon a complete train of the London Underground Railway (Metropolitan District Railway) and operates with admirable efficiency. The locomotive superintendent, Mr. Speck, states that it is the best brake ever used on that line and will pay its first cost within a year.

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The St. Gothard Tunnel.

The machine piercing of the Swiss tunnel through the Alps commenced last month. The cost of the preliminary arrangements, plant, etc., is estimated at about $400,000. The compression of the air for the rock-boring machines and the machine work of the shops will be effected by hydraulic motors of a combined power of 500 horses. At the northern extremity of the tunnel, there is an available fall of water of about 95 feet, close to the entrance, which will be utilized for turbines. At the southern end the waters of the Tremola, with an available fall of 984 feet, will be turned to account with turbines or by a hydraulic machine with vertical column of water. It is expected that upwards of 100 yards at each end of the tunnel will be driven each month, or considerably over a mile by the end of the year.

The Swiss *Times* says: The first monthly report with reference to the state of the works of the St. Gothard line has just been published. This report, which has already been communicated to the governments interested, shows that on the 31st of December the tunnel at the Göschenen end has been pierced 60 feet, at the Airolo end 336 feet, or nearly 400 feet altogether. At Airolo 43 feet of the masonry of the arch has been completed. The average number of workmen employed during the month of December was 272—171 at Airolo, and 101 at Göschenen. In addition to the work already executed on the tunnel proper, about 60 feet of the cutting at the opening of the tunnel have been completed. At this side the boring has hitherto been entirely through hard granite. At Airolo, although softer descriptions of stone have been met with, operations have been carried on with extreme difficulty, on account of the water filtering very abundantly through the rocks. Strata of dolomite and mica-schist, with veins of quartz, have been met with.

BRIDGE OVER THE MISSOURI RIVER, NEAR LEAVENWORTH, KANSAS.

There is no branch of engineering in which the native genius of America is more effectively displayed than the construction of bridges. The almost illimitable West presents, in its rivers, gorges, and mountain sides, localities difficult enough to trouble the ingenuity and numerous enough to weary the patience of any ordinary mortal. But these things are to our engineers merely opportunities to display their skill and perseverance, and the clever devices and fertile invention of our railroad constructors have always been equal to the occasion, and have elicited the admiration of the civil engineers of the old world. Our present instance is a bridge for both railroad and highway traffic, erected over the river Missouri at a distance of 1⅞ miles north of Leavenworth, Kansas. It is entirely of iron, and very substantial; and it presents a fine appearance. The funds required to construct it were principally raised by bonds, which nearly all the prominent citizens personally pledged themselves to redeem, and which were thus negotiated in New York.

Work on the approach was commenced on July 20, 1869, but the piers were not started until October following. On October 20 the first column was placed in position, and on July 1, 1871, the whole substructure was completed. The bridge would have been completed fully twelve months earlier, had not many vexatious delays occurred. The total weight of wrought iron in the bridge is 2,093,300 lbs., and of cast iron 700,417 lbs., making a weight of iron per lineal foot of 2,812 lbs., exclusive of the floor. The bridge consists of three spans, the western and middle being each 340 feet, and the eastern, 314. Being intended for both railway and highway traffic, a single railway track is laid in the middle of the roadway, and the top course of floor planks is laid even with the top of the iron rails, so that wagons can pass freely from one side to the other. The western railroad approach may be considered as extending from the end of the bridge to a point where any railroad desiring can connect with it. This point is about 1,500 feet from the bridge, and is reached by a cutting through a hill, with a maximum depth of 50 feet. The eastern railroad approach commences at the bridge, with a substantial wooden trestle 50 feet high, decreasing in hight to 35 feet in a distance of 1,600 feet; it is then continued by an earth embankment 2,400 feet further, to a point where the grade is but 10 feet above the natural surface, and where all desired railroad connections can be easily made.

The most remarkable feature about the bridge, and the one which, by its comparative cheapness and peculiar adaptation to the conditions of the Missouri river, enabled the work to be undertaken and completed, is the use of pneumatic iron columns for piers. In no case had this principle been carried to such a depth or to so great a hight. How successful the experiment has proved is best seen and appreciated by an inspection of these graceful and substantial piers.

The total cost of the bridge was $800,000. The whole work was planned by the engineer in chief, General W. W. Wright, under whose personal supervision it has been executed.

Rather Foggy.

There often appears in Europe and in some parts of America, a peculiar kind of dry fog which is visible during the early morning of summer days, and is regarded as a presage of fine and warm weather. It is of a reddish tinge and is hardly visible except through distances of several miles, when it appears near or above the horizon in proportion as the dryness and heat of the atmosphere are less or more augmented.

In explanation of this phenomenon, M. Collas, in *Les Mondes*, advances the theory that it is due to the combustion of aerolites or shooting stars. These bodies, coming within the sphere of attraction of the earth, are precipitated to its surface at a speed which is considered to exceed twelve miles per second. By this great rapidity, they are heated, inflamed, and finally volatilized. The vapor thus produced is rapidly condensed into particles so extremely small that they may be regarded as the last limit of the divisibility of solid matter. These descend to the earth with great slowness on account of their tenuity, and are scattered, by the winds, to various quarters where they appear as the dry fogs.

Ruins of the Boston Fire.

Although it is some months since the great fire, the rains and snows of winter have not succeeded in entirely quenching it. In many parts of the burnt district, dense columns of smoke are still ascending, and bright flames dart out from beneath piles of brick and granite. The influence of heat upon various kinds of merchandise found among the ruins has afforded, says the *Boston Journal of Chemistry*, examples of metamorphosis interesting and curious in a high degree. Huge piles of leather in some cases were precipitated into cellars, and so covered with *débris* as to undergo a kind of dry distillation or fusing, out of contact with air. The resultant mass resembles a dry gum, with a clean vitreous fracture, upon the surfaces of which are seen the lines between the hides, like thin strata in a mass of silt. We have a lump of coke, produced from clover seed, which closely resembles cannel coal. It came from a mass of two thousand bushels which tumbled into a cellar, and was subjected to dry distillation under the bricks and mortar. Many other substances have undergone curious changes, and we may allude to some of them at a future time.

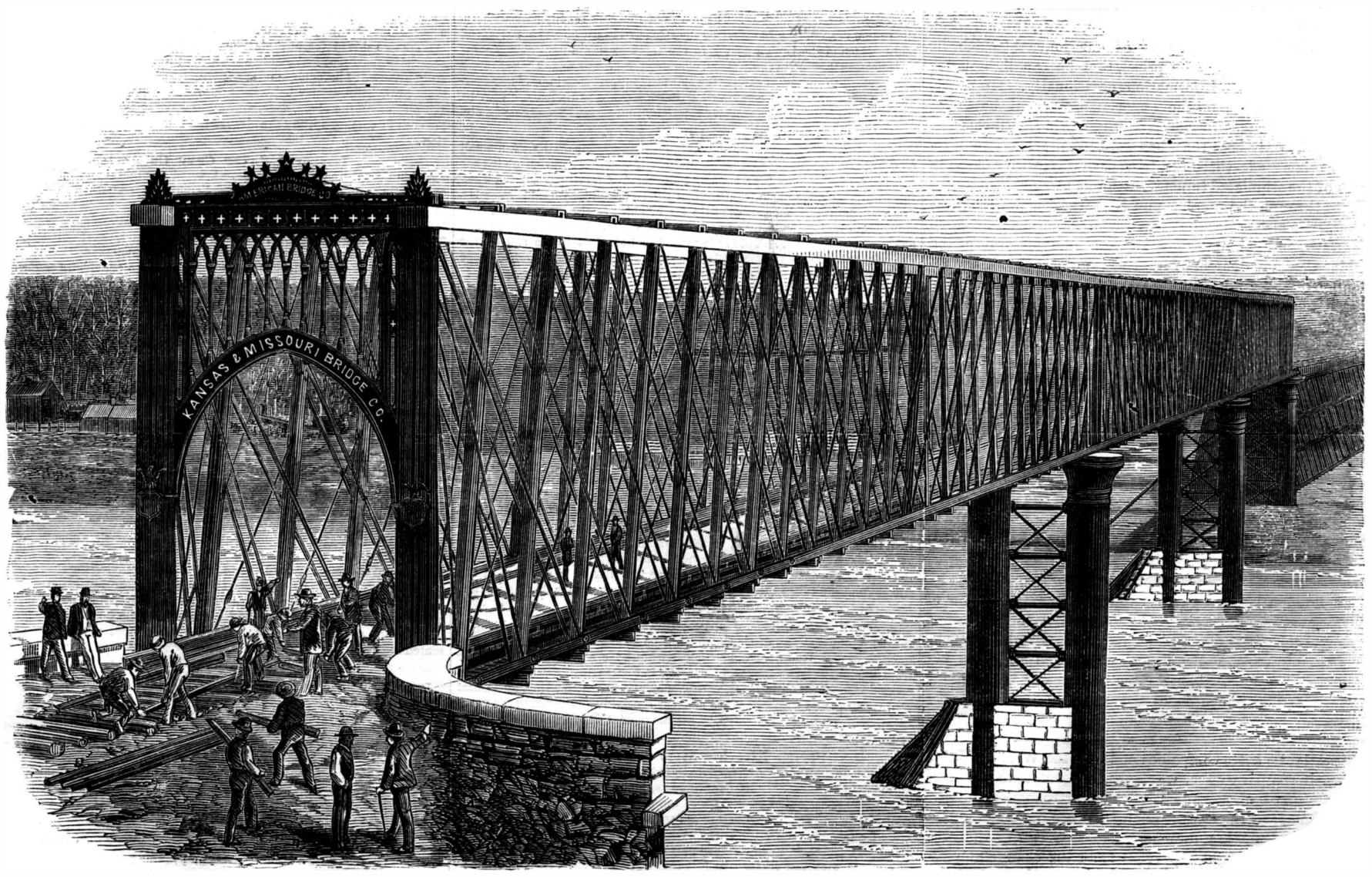
The Bar at the Mouth of the Mississippi.

A correspondent, E. B. B., of Cal., refers to the report of Mr. C. W. Howell, U. S. engineer, on the value of the screw dredging machines employed. He states that between December, 1868 and May, 1869, a channel originally 12 feet in depth was dug down to 17 feet at mean low tide, and nearly to 18 feet at high tide; and to show the efficiency of this apparatus, he mentions that the channel began to fill up when the screw ceased working. In another instance, 22,400 cubic yards of earth was dug out in 28¼ hours; a channel was cut to a depth of 19 feet and another to 18 feet 10 inches. The work was done so thoroughly that, during one year, all vessels drawing not more than 19 feet water went over the bar, and one ship of 20 feet draft passed over; and he avers that there has been a depth of from 17 to 19 feet on the bar for three years and more, for proof of which he refers to the official reports of the government engineers.

He quotes these facts to show that Mr. Stewart's statement that costly dredge boats can hardly keep a channel open to a depth of 14 feet is erroneous. The work which he describes was done with Bishop's submarine screw, with spiral boiler-iron scrapers.

Novel Life Preserving Apparatus.

M. Tellier, in *Les Mondes*, proposes a new method for saving shipwrecked persons. His apparatus consists in a life preserving vest, a balloon of a few cubic yards capacity attached to the belt of the swimmer, and a receptacle for holding liquefied ammoniacal gas which is fastened to the life preserver. When the vessel strands, the person to be saved turns a cock which allows the gas to flow through a long rubber tube and distend the balloon. As the latter rises, he jumps overboard. He is then buoyed up by his life-preserving waistcoat and also by the balloon which, being acted upon by the wind, tows him to the shore. By this means, it is suggested that a person might carry a line from the wrecked vessel to the beach, or an apparatus might be devised to contain several individuals who could thus be drawn ashore in safety.



THE GREAT KANSAS AND MISSOURI BRIDGE.

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Glycerin in Boilers.

At the last *séance* of the Society of Civil Engineers, Paris, M. E. Asselin recommended the use of glycerin to prevent incrustation in steam boilers.

Glycerin, soluble in water in every proportion, increases the solubility of combinations of lime, and especially of the sulphate; it appears, besides, to form with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor form with the glycerin soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. Moreover, the gelatinous substances thus formed are not carried with the steam into the cylinder of the engine.

M. Asselin advises the employment of one pound of glycerin for every 300 or 400 pounds of coal burnt, fifteen days supply being introduced at once. From trials made with boilers fed with bad water, it was proved that the glycerin combined with all the salts, and left the plates perfectly clean.

Sewing Machine Sales.

The sales of sewing machines in 1872, just reported, show, says the New York *Sun*, the following remarkable results:

	Machines
Singer Manufacturing Company sold	219,758
Wheeler & Wilson Manufacturing Company sold	174,088
Howe Machine Company (estimated) sold	145,000
Grover & Baker Sewing Machine Company sold	52,010
Domestic Sewing Machine Company sold	49,554
Weed Sewing Machine Company sold	42,444
Willcox & Gibbs Sewing Machine Company sold	33,639
Wilson Sewing Machine Company sold	22,666
Amer. B. H. O. & Sewing Machine sold	18,930
Gold Medal Sewing Machine Company sold	18,897
Florence Sewing Machine Company sold	15,793
B. P. Howe Sewing Machine Company sold	14,907
Victor Sewing Machine Company sold	11,901
Davis Sewing Machine Company sold	11,376
Blees Sewing Machine Company sold	6,053
Remington Empire Sewing Machine Company sold	4,982
J. E. Braunsdorff & Co. sold	4,262
Keystone Sewing Machine Company sold	2,665
Bartlett Reversible Sewing Machine Company sold	1,000
Bartram & Fanton Manufacturing Company sold	1,000
Secor Sewing Machine Company sold	811

DURING the recent session of the National Academy of Science, at Cambridge, Mass., Professor Mayer gave some interesting information regarding the effect of magnetism on iron: He states that he has discovered, by means of the Saxton comparator, that rods of iron suffered a permanent elongation by magnetization of one hundred and fifty millionths of an inch. English refined iron gave the maximum of elongation, scrap iron, the minimum. Whether the current was gradually increased in intensity, or whether it was sent full charge at once, it produced the same degree of elongation. With one cell the elongation took place in six tenths of a second; with 25 cells it took place in two tenths of a second. Professor Pierce thought if the elongation of iron under magnetization were true, it might make its effect on the earth in an appreciable difference in the length of the day. This could be detected by astronomy. A change in the day of seven hundredths of a second would be perfectly easy to discover now.

A CORRESPONDENT, C. B. of Newark, N. J., thinks, when he pays a few cents for a copy of our journal (which, he says, is worth ten times its price), that he can lighten our labors by sending us information occasionally. He states that our recent article on the experimental canal boats has caused an excitement in Newark, where it is stated that the Baxter is the only boat that has fulfilled the legal requirement, having made three full trips each way, with a cargo in excess of the stipulated tunnage, at a rate of over three miles an hour through the canal. The Newarkers claim the prize for her. He also states that Mr. H. M. Paine has returned to Newark, and is engaged on an electro-motor for sewing machines. Another item of interest is an account of the reinvention of the engine with its cylinders curved longitudinally, a form applied on the U. S. frigate Princeton, thirty years ago. A Newark firm has constructed such an engine to order, and is patiently waiting for the "inventor" to fetch it away.

ROSE CUTTINGS.—The most certain way of rooting rose cuttings is by bending the shoots and inserting both ends into the ground, leaving a single bud uncovered at the middle and on the surface of the ground. The cuttings are about ten inches long, and are bent over a stick laid flat on the ground, holes being dug on each side of the stick for the reception of the ends of the shoot. The roots form only at the lower end of the shoot, but the other end, being buried, prevents evaporation and drying up.

THE London *Times* says that the recent transmission of the Queen's speech throughout England evidenced some very rapid telegraphing. The document contained 858 words, and reached York, a distance of about 200 miles, in six minutes and a half. Wheatstone's automatic instruments were used. The above is at the speed of 132 words per minute.

THE Atlantic cable companies and also the Western Union Telegraph company have, we learn, consented to the free transmission of dispatches relative to astronomical discoveries to and from the Smithsonian Institute in Washington. The object of telegraphic communication is to avoid the difficulties which might supervene from the change of position of the observed bodies during the interval required for postal correspondence

A number of very severe tests were recently applied in England, to dynamite with a view of showing that it could be safely transported on one of the principal railroad lines. It is stated that no explosion occurred when a box containing five hundred weight of sand was dropped from a hight of forty feet upon a mass of cartridges, although the latter were badly crushed and broken. It was also proved that a fire in a railway train containing dynamite need not cause any more anxiety than would be experienced from a conflagration of ordinary timber or similar material. A fifty pound box of the substance thrown into a bonfire burned with a powerful flame for two or three minutes, but no explosion took place. Loose cartridges laid upon rails exploded when run over by cars, but loose dynamite sprinkled near them was unaffected.

The John Leland cheese factory, at Cheshire, used up 1,046,210 pounds of milk, last year, producing 104,976 pounds of cheese, or a pound of cheese for each $9\frac{9}{10}$ pounds of milk. The receipts were $12,786, and the stock pays 9 per cent in dividends.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From February 4 to February 10, 1873, inclusive.

ENGINE VALVES, ETC.—G. F. Blake, Boston, Mass. (Two patents.)
FIRE ARM.—H. Berdan, New York city.
HAT.—R. Eickemeyer, Yonkers, N. Y.
HEAT DISTRIBUTOR.—D. Shedd, New York city.
HOE.—M. Ceokerly, Baxter Springs, Kan.
KILN.—A. Morand, Brooklyn, N. Y.
LINING BOARD, ETC.—G. S. Levy, New York city.
MAKING SCREWS.—J. A. Ayres, Hartford, Conn.
PENCIL AND ERASER.—J. Reckendorfer, New York city.
PRESS, ETC.—B. G. Martin, New York city.
SEEDING RAISINS.—C. Dixon, New York city.
SCREW PROPELLER.—J. L. Cathcart, Washington, D. C., J. S. Negley, Pittsburgh, Pa.
TREADLE MOTION.—G. B. Kirkham, New York city.
UNIVERSAL TOOL.—W. L. Grout, Boston, Mass.

NEW BOOKS AND PUBLICATIONS.

THE ILLUSTRATED ANNUAL OF PHRENOLOGY AND PHYSIOLOGY FOR 1873. By S. R. Wells, Publisher of the "Phrenological Journal" and the "Science of Health." 25 cents. New York: Samuel R. Wells, 389 Broadway.

A neat little book, the character of which is indicated by its title and place of publication.

BREAD-AND-CHEESE AND KISSES. By B. L. Fargeon. Illustrated. Harper & Brothers, Franklin Square, New York.

A pleasant story, beautifully told. The publishers have hardly done justice to its merits, as the illustrations are simply execrable.

Recent American and Foreign Patents.

Improved Snow Ram for Railroads.

William C. A. Frerichs, Tottenville, N. Y.—The invention consists in a tunneling snow ram for railroads. The forward end of the ram is made wedge-shaped, and the top is curved and extends up to or a little above the top of the body of the ram. The sides of the hood project so that the said hood may form a tunnel larger than the body of the ram. In the rear part of the body is placed a suitable engine to drive fan blowers. In the forward part of the body are placed two furnaces into the upper parts of which the blast from the fan blower is introduced, to be heated and driven out through pipes which pass into the space beneath the hood. The furnaces are surrounded by an air-tight space into which the blast from the other fan blower is introduced. This air circulates around the furnaces, becomes heated and is designed to keep the outer surface of the hood sufficiently heated to prevent the snow from sticking to it, and to cause the snow to pack. The smoke stacks are hinged so that when the ram is at work they may be turned down out of the way. The bodies of the cars readily pass through the tunnel formed by said ram. To the sides of the car bodies are attached plates which project down nearly to the track to guard against any snow slide passing in beneath the cars and clogging them. The spaces between the platforms of the adjacent cars, at the sides and top, are shut in by plates overlapping each other, and connected with each other and with the cars by springs, to give them the necessary elasticity for passing around curves, etc.

Improved Car Starter.

James J. Wheeler, Grinnell, Iowa.—This invention consists of a small frame of two legs, connected together by suitable cross bars. Each leg has a clamping foot adapted for clamping the head of a rail—one acting when forced downward, and the other when raised upward. On said frame is a drum and crank, with a rope or chain for hitching to the car, which is thus moved by winding the chain or rope on the drum. The frame is confined on the rail by the clamps, which are caused to hold fast to the rail by the one next to the car being forced down on the rail by the strain upon the rope or chain, and the other by being forced upward by the said strain.

Improved Truck Barrow.

James J. Richardson, Marion, S. C.—This invention relates to an improvement in barrows or trucks of the class in which the wheels are arranged under the body of the truck; and it consists in the arrangement of a cross bar to scrape the wheels of the barrow and connect its sides. The wheels are arranged to revolve on a stationary shaft secured on the under side of handle rails. The front posts mortised into the upturned ends of the handle rails support the removable front boards and the forward ends of the side boards. A cross piece standing edgewise is provided by which the bottom ends of the posts are connected, and the wheels scraped. This arrangement raises the bottom and allows the weight or load on the barrow or truck to rest directly over the wheels. This allows the barrow to be used as a truck, the load in either case being discharged over the front end when desired. In handling cotton bales and other heavy articles the side boards are removed, and such articles are loaded and discharged as when a truck is used. Braces and straps of iron are applied wherever necessary to strengthen the connections, and add to the durability of the combined articles. Thin pieces of sheet metal are attached to the forward cross piece opposite the wheels, the design of which is to scrape the tires or peripheries of the wheels, and thus keep them clear of mud, mortar, or other adhering matter.

Improved Bottle Stopper.

Herman F. Reiner, Blairsville, Pa.—This invention has for its object to furnish a stopper for bottles which shall be so constructed that the influx or efflux of liquids is rendered possible without the removal of the stopper from the bottle. The invention consists in the employment of a stopper composed of a metallic tapering tube which is provided with a horizontal centralflange and with a bayonet slot for receiving and securing the vertical stem of a conical disk valve, by the movement of which stem the valve is opened or closed to admit of the induction and discharge of liquids.

Spring Attachment to Car Windows.

George Cornwall, Brooklyn, N. Y.—This invention relates to a spring attachment to the sashes of car windows, and more particularly to such sashes as are let down into boxes of the car frame when opened. The invention consists in the application to each upper end of the sash of one or more U-shaped inverted springs, whose ends are fastened to the faces of the sash, while their upper rounded parts project above the sash and come in contact with the frame of the window to prevent rattling either in closed or open positions of the sash, and to adapt them to serve as handles for raising and lowering the sashes.

Improved Cultivator.

Amos B. Colver and John Priest, Albany, Oregon.—This invention consists of a triangular cultivator with an adjustable device for varying the depth of the furrows by shifting and maintaining it at different hights on a truck of two wheels at the rear, and a caster wheel at the front; for raising it above the ground, and supporting it for moving it on the road.

Improved Sewing Machine Cover Hook.

John C. Egly, Philadelphia, Pa.—This invention relates to a new means of applying a hook fastening to the cover of a sewing machine table, so that if the wood of the cover or table should shrink or warp the fastening may be readily adjusted to the change. It consists in making the hook adjustable in a recess of the table, and in combining it with a slotted plate, whereby it is held in place. The shank of this hook is made in the form of a flat rectangular plate, to fit a mortise in the table, wherein it has backward and forward play. A plate is fitted to the table as a cover to this mortise, and is fastened by screws so that it bears upon the shank. The hook proper projects through a slot of this plate When the desired position has been assigned to the hook, the plate is firmly screwed down, and bears upon the shank so as to hold the hook in place. If the table or cover should shrink so as to require the readjustment of the hook, it is only necessary to slightly loosen the plate, reset the hook, and then refasten it. This invention also makes it convenient to fit covers to tables when either is not of the exact size required.

Improved Dish Washing Machine.

Joseph Usher, West Albany, N. Y.—This invention has for its object to furnish an improved machine for washing dishes, which shall be so constructed as to wash the dishes quickly and thoroughly. In using the machine, the dishes to be washed are arranged and secured in a frame, and placed in a metal case which rests on gudgeons which pass through holes and revolve in bearings in an outer box. A quantity of water, or soap and water, is then placed in the case and the door is closed and secured. The case and its contents are then revolved a few times—first in one direction and then in the other—which quickly cleans the dishes. The door is then unfastened, and the case is turned, allowing the water to run off. A quantity of clean water is then poured into the case and the dishes are rinsed in the same manner as they were washed, after which the rinsing water is emptied out in the same manner as washing water, and the frame and the dishes are removed and placed in a drawer beneath. When the dishes are to be used they are removed from the frame and wiped with a clean cloth.

Improved Wood Pavement.

Mary H. Alexander, Newark, N. J.—This invention consists in making a pavement of a series of wedge shaped blocks, flat on top, notched across one of the upper ends, and driven into the soil at right angles to each other, so that each one may be supported by another, braced lengthwise against each of its opposite ends. The object of the corner notch is to bring the filling spaces in small zigzags or right angled triangles, and thus afford good foot hold without the necessity of cutting away the block too much or wasting the filling. This would seem to be an important improvement and advance in wood pavements.

Improved Paper Box.

Moses W. Dillingham, Amsterdam, N. Y.—The object of this invention is to provide convenient and efficient means for holding the covers to paper boxes without tying them, and it consists in pieces of pasteboard or other suitable material attached to the box and to the cover. On the outside of opposite sides of the box, or on one or two of the corners and one of the ends or sides, are attached strips of pasteboard at or near the upper edge. On the inside of the cover are also attached similar pieces, arranged to correspond in position with the pieces on the box and so that there shall be a recess for each piece on the box, and so that any two of such pieces—one on the box and one on the cover—shall engage with each other, and thereby hold the cover securely to the box.

Improved Horse Power.

Zachariah P. Landrum, Columbus, Miss.—The invention consists in a new mode of applying the levers to horse powers so that the length of power arm to that of weight arm can be increased without requiring any greater space for the sweeps, thereby giving great leverage and enabling one pair of horses to do easily what heretofore two have done with difficulty. This invention affords a very convenient and smoothly working horse power, which has been practically tested and received by the public with great favor.

Improved Corn Coverer.

John Tweedy, Vernon, Ind.—The invention consists in combining a clod mover with a leveler and pair of covering plows, and in the means of attaching and holding it in position. The plows are inclined inward so as to throw the soil into the furrow and cover the corn. The end parts of a semicircular or arched mold board are attached to the lower parts of the standards, and are so formed as to round up or ridge the soil over the corn so as to prevent the corn from being carried off by the crows, and to prevent the soil from being washed away by the rain. The sod mover or leveler is formed by attaching two side plates, at their upper edges, to the side edges of a small triangular top plate, which meet in a sharp inclined edge, so that the said device may be V-shaped in its horizontal section. The clod mover may be adjusted forward or back, as may be desired, and moves along the top of the ridge and pushes off the clods, sods, and other obstructions that might impede the corn in coming up, and thus leaves the top of the ridge in proper condition.

Improved Sugar Cane Cultivator.

Alcide Trouard, New Orleans, La.—A wood or metal cylinder is provided or set with teeth having sharp or curved arrow-shaped points. The cylinder revolves around an axle, which is mounted or journaled in levers that are pivoted at their forward ends to the frame bars, and are adjustable vertically at their rear ends. The bars with the cross bars, constitute the frame proper of the machine, which is supported on runners made in the form of ordinary sled runners. Horizontal bars or rods are provided for cleaning the teeth of the cylinder. Before the machine can be used the stubble is barred off by running a plow on each side of the row. A shaver on slides is then run in the furrows to shave or slice off the stubble to an even length. This machine is then run in the same furrows, and the hook teeth of the cylinder enter between the stubble stalks and grub or pick out the earth. The cylinder is adjusted vertically to correspond to the condition of the soil or stubble.

Improved Glove.

Edwin V. Whitaker, Gloversville, N. Y.—The invention relates to gloves made with leather palms and cloth backs, and consists in cutting a glove with the thumb and all the forgets, except for middle finger, in the same piece with the palm. The purpose is to economise the material, give the exact relative quantity of leather to each, and make the forgets seamless at the points between the fingers. A much smoother and more accurate fit may thus be given to gloves, while the irdurability is also greatly increased.

Improved Meat Chopper.

Jesse Battey, Manchester, N. J.—This invention consists of a novel contrivance of pawls and a shifting device with a ratchet bar having two sets of ratchet teeth, reversed as to each other, for moving the chopping box and reversing it from one direction to the other. The invention also consists of an intermittingly reciprocating square chopping box, combined with a vertically moving blade and a carrier for the box, in such manner that the box can be turned a quarter of a revolution, and thereby be presented to the blade so that the meat will be chopped crosswise.

Improved Inkstand.

James B. Thurston and Frank M. West, New York city.—The invention relates to an improvement in the class of inkstands or holders in which two or more receptacles are arranged to be revolved around a central axis to bring them successively or at pleasure under an opening in a cover; and it consists in suspending the ink receptacles by their upper edges from a perforated disk or plate adapted to revolve in contact with the under side of the cover of the inkstand, and in the arrangement of a spring and lug or projection of the cover for locking the revolving disk

Improved Paper File.

Emanuel Motz, Woodward, Pa.—This invention relates to an improved device for holding newspapers or other papers filed, and consists in the combination of a rod with a binding string and winding pin, the bar furnishing the rigid back for the papers filed, while the string ties the papers together and to the file, the pin holding the string in proper tension.

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Improved Binders' Table for Harvesters.

James H. Smith, Orford, Iowa.—This invention consists in converting the tables combined with a binding trough and platform for a harvester attachment for binding grain into a bundle-carrying and dumping attachment, the tables being hinged to the binding attachment and connected with tilting levers peculiarly arranged, whereby the bundles may be dumped upon the ground by the driver when a quantity sufficient for a shock has accumulated. The tables for receiving and carrying the bundles are made much larger than heretofore, and hinged so that they can be used to hold and carry the bundles and tilted to dump them. They are connected to tilting levers, pivoted to an extension of the frame above the carrier by rods. This extension of the frame is arranged by the side of the seat where the lever, which is provided with a handle, can be conveniently reached by the driver to tilt the tables. Said levers are connected together by a pin in one and a slot in the other, so that both are actuated by one and the same operation of the handle The spring is arranged with one lever to throw the tables back after being tilted. The tables have numerous stud pins projecting upward to hold the bundles, so that they will not be shaken off while being carried to accumulate a sufficient quantity for a shock. By this contrivance the labor of gathering single bundles together in shocks by hand is saved.

Improved Chromatic Printing Press Attachment.

Edward A. Howitt, Whitewater, Wis.—This invention relates to printing presses with movable inking disks; and consists in the application to the face of the disk of metal straps, readily removable and quickly applied.

Device for Producing Pearl Finish on Metallic Surfaces.

Bernhard D. Beiderhase and Charles Witteck, New York city.—The object of this invention is to provide means for producing what is known as "pearl finish" on metallic surfaces; and it consists in a head with one or more projecting clusters of wire therein, the device being more especially designed for the inside of silver or other metallic vessels, but applicable to the outside also.

Device for Producing Satin Finish on Metallic Surfaces.

Bernhard D. Beiderhase and Charles Witteck, New York city.—This invention relates to the finishing of metallic surfaces, whether the outside or inside surfaces of vessels or flat or irregularly formed plates; and it consists in one or more clusters of wire connected with screw eyes or loops attached to a head which is screwed to the end of a revolving mandrel, the said cluster of wire being connected with the said screw eyes by means of loose plates in such a manner that when the head is rapidly revolved the clusters of wire will fly out radially by centrifugal force, and present a series of metallic points, which, when in contact with a metallic surface, will make slight indentations therein and produce what is known as the "satin or pearl finish."

Improved Blackboard Eraser.

Winfield S. Read, Oakland, Cal.—The object of this invention is to furnish convenient and efficient means for erasing the chalk marks from blackboards in school rooms and similar places; and it consists in a pad formed with a wooden back and a corduroy or ribbed face. The advantage of this corduroy or ribbed covering is that the chalk dust will be detached from the blackboard by the ribs and will find a lodgment in the grooves between, whence it readily drops into the chalk box below.

Improved Combined Tobacco Box and Match Box.

Charles Remhof, Brooklyn, E. D., N. Y.—The invention consists of a combined tobacco box and match safe. It is a sheet metal box, partitioned for the reception of a match drawer, said drawer having a retaining check, and the the ribs, hinged sides of the box being braced by said partition.

Improved Plow.

Joseph W. Reed, Careyville, Mo.—This invention has for its object to furnish an improved plow for breaking up prairie sod, which shall be so constructed as to be of easier draft than plows as heretofore constructed, while doing the work equally well, so that two horses may do with ease the work which requires three or four horses when the ordinary plows are used. The land side handle is bolted to the rear end of the plow beam and its lower end is bolted to the rear part of the landside. The mold board handle is connected with the handle by rounds, and the lower end of it is bolted to the rear part of the mold board. The upper end of the standard is bolted to the beam and its lower end is bolted to the land side. The bed plate is made wide, so that it may receive and support the rear part of the share and the forward part of the mold board. It is also made thin and is welded to the land side, so that it may be close down to the bottom of the furrow, and its outer end projects to the outer part of the share so as to fully support it. The land side is made long, so that the share may project forward about six inches further than an ordinary plow. This enables the share and mold board to be made with such a gradual rise that they may pass the standard about three inches lower than in an ordinary plow.

Improved Rotary Churn.

Wilson McClure, Sinking Spring, O.—This invention has for its object to furnish an improved churn, simple in construction, convenient in use, effective in operation, and not liable to get out of order; and it consists in a box which rests upon legs which are so formed that their upper parts, when left free, may stand out from the sides of the box. Rods are placed so as to press the sides against the end edges of the ends from the bottom to the top of the box, by which construction the shrinking and swelling of the wood will not tend to open the seams of the box, but will only vary its hight. The upper rod moves up and down with the swelling and shrinking of the wood without affecting the tension of the rods or allowing the joints to open. To the dasher shaft are attached four pairs of radial arms. To the alternate pairs of radial arms are attached two round bars, at a little distance apart; and to the other pairs of arms is attached a round bar, in such a position as to be opposite the space between the round bars of the other pairs of arms. The part of the round bars between the arms is made hollow and is filled with heavy material, to cause the dasher to strike the milk harder and heavier and to give it a steadier motion, adapting it to serve as a fly wheel. In one end of the dasher shaft is inserted a pivot, which is held out by a coiled spring inserted in a recess in the end of said shaft. In the other end of the shaft is formed a square socket to receive the squared inner end of the pivot which rests against the inner surface of the side of the box against which it is gently pressed by the action of the spring pivot to assist in preventing the escape of milk through the hole in which said pivot works. By suitable construction, as the box swells and shrinks, by loosening a screw the drive wheel may be adjusted to always gear properly into the gear wheel.

Improved Hose Bridge.

Gilbert J. Orr and Charles E. Gildersleve, of New York city.—This invention has for its object to furnish an improved device for enabling street cars to readily pass over hose stretched across the street, so that the cars and passengers need not be detained. The middle part of the body of the bridge is made parallel or nearly parallel with the rail, and its end parts incline downward to said rail upon which they rest. The upper surface of the bridge may be made simply with an upwardly projecting part for the tread of the car wheels to run upon, and for the flange of said wheels to bear against. The ends of the bridge must be made to correspond with and fit closely upon the rail so that the car wheels may pass readily from and to the said rail bridge. Upon the lower surface of the end parts of the bridge are formed projections to serve as guides in adjusting said bridge upon the said rail. Upon the lower surface of the end parts of the said bridge are formed, or to it are attached, lugs to bear against the flange of the rail and sustain the side pressure. The central part of the bridge is left open to enable one, two, or more hose to be passed through. To the middle part of the bridge is rigidly attached a downward projecting arm of such a length that its lower end may rest upon the flange of the rail, and upon said lower end is formed a jaw to rest against the inner side of the said rail. Directly opposite the arm is formed a lug, to which is hinged another arm which is made of such a length that its lower end may rest upon the outer part of the rail, and which lower end has a jaw formed upon it to rest against the outer side of the rail. The jaws are made of steel, and their faces are roughened to enable them to take a firm hold upon the sides of the rail. By suitable construction, when the bridge has been adjusted upon the rail, by one or two turns of a screw it will be clamped securely to said rail, so that it will not be moved by the car wheels as they run upon and from it. The iron part or rail of the bridge may be made hollow or tubular, if desired, to give it lightness while possessing the necessary strength.

Improved Bottle Stopper.

David M. Cumings, Newburyport, Mass.—This invention relates to an improved device for fastening stoppers in bottles. The stopper is made of suitable material fastened to a metallic center pin, and its shape is cylindrical, with an enlarged upper end. An elastic collar or covering surrounds the entire stopper on all sides except the bottom. The pin has a flange which rests on top of the elastic collar. The lower end of the pin forms a rivet head against the lower end of the stopper. A double wire yoke is hinged to a ring which embraces the neck of the bottle and is connected with the pin and stopper. To another ring that embraces the neck of the bottle, is hinged a lever which has a projecting arm. When the stopper has been inserted within the mouth of the bottle the lever is swung up, and its arm crowded over the horizontal end of the yoke. It thereby tends to force the yoke, with its appendages, down, while the lever itself and ring are drawn up. In this way the stopper is forced into the bottle and held therein. The lever being locked in the yoke, the enlarged outer part of the collar is forced out or up within the mouth of the bottle, and thereby serves to seal and close the same hermetically.

Improved Car Coupling Attachment.

William G. Brown and James W. Jedkins, Monmouth, Maine.—This invention has for its object to furnish an improved device by means of which the operation of coupling the cars may be simple, easy, and perfectly safe. In the outer end of the draw bar is formed the cavity to receive the coupling link, through which the coupling pin passes in the ordinary manner. The ends of a bail are pivoted to the opposite sides of the draw head. This bail is made of such a length that it may move up and down in front of the bumper head, and to its arms are secured downwardly projecting arms, to the lower ends of which are pivoted the forward ends of the connecting bars, the rear ends of which are pivoted to the lower end of the levers which connect with a shaft and operating lever. A spring is coiled around the shaft and one of its ends is secured to said shaft. The other end of the spring is secured to the car frame so as to hold the said shaft securely, except when operated to raise the bail. Upon the outer ends of the shaft are formed levers which are curved downward, rearward, and upward, so that when the bail is lowered they may be entirely out of the way, and may be conveniently grasped to raise the bail, and thus raise the link so that it will surely enter the bumper head of the adjacent car. To the forward part or bow of the bail are attached or upon it are formed two arms, which project forward and downward so that, as the cars are run together, should the attendant neglect to lower the bail, the bumper of the adjacent car may strike the arms and push the bail down so that it may not be struck and injured by the bumper heads as they come together.

Improved Cotton Planter.

William E. Rhodes, Darlington Court House, S. C.—This invention consists in improving cotton planters so that they may be more practical in operation. The dropping wheel is made of such a size that its upper side may project into the hopper to take out the seed. In the face of the dropping wheel are formed notches to receive the seed and carry it out of the hopper. These notches, when the seed is to be dropped in drills, are continued all around the wheel. When the seed is to be dropped in hills one or more notches are made in the wheel, according to the required distance apart of the hills. To the upper side beam is attached a slotted plate, to prevent the beam from being worn by the wheel, and to prevent any seed from escaping at the sides of the said wheel. The size of the opening through which the seed is carried out is regulated by an adjustable slide. The hopper to receive the seed is attached to the rear end of the beam, so that the said beam may serve as a bottom to the hopper. A spout is attached to the lower side of the beam to receive the seed from the wheel and guide it into the channel made by the drill opener, which may be readily adjusted to open the drill to the desired depth. To the opposite sides of the drill opener are attached wings to push back clods, coarse manure, and other substances that might impede the proper operation of the machine. To the middle part of the upper side of the covering block is attached the lower end of a bar, by adjusting which the coverer may be adjusted to bear with any desired force upon the ground, or raised from the ground as may be desired. To the axle at one side of the hopper is attached a gearing which revolves a shaft in bearings in the sides of the hopper, and to which, within said hopper, are attached radial fingers which, as the machine is drawn forward, keep the seed in the lower part of the hopper stirred up so that it may be carried out by the wheel uniformly. In the rear side of the hopper is formed a hole closed by a slide, wholly or partially left open by a pin which passes through holes. The slide is designed for use in regulating the amount of seed sown, so that the machine may be adjusted to sow more or less seed, as may be desired, without stopping the horse.

Improved Sewing Machine Chair.

Franklin Chichester, Milwaukee, Wis.—This invention has for its object to furnish an improved sewing machine chair which shall be provided with a yielding back, and so constructed that it may be adjusted in hight or inclination as the convenience of the operator may require. The pedestal may be of any desired form. To it is secured a nut to receive a screw, by turning which the chair seat may be raised and lowered as desired. The upper end of the screw is formed upon a cross bar, to the ends of which is pivoted the seat frame. By suitable mechanism the chair seat may be tilted or adjusted at any desired inclination or in a horizontal position, as may be desired. To the cross bar or spider is attached a spring connected with the seat frame, so as to tend to tilt the seat frame back. The chair may be used as a spring rocker. The lower part of the back is so arranged as to always adjust itself to and support the back of the operator.

Improved Earth Closet.

John L. Young, New York city.—This invention consists in spouts for distributing earth, in operating the ring soil carriers by means of rack and pawl connected with cover, and in operating said carriers in reverse directions. The distributing spouts are directly above the bucket, and rest on the top of the chest. These spouts are cut from a sheet metal plate which forms the bottom of the reservoir, the center of the plate being cut away. The dry earth is introduced into the hollow back, the base of which is in connection with the space above the chest from the reservoir. To carry the earth contained in the reservoir to the spouts two rings are employed, which are revolved on the bottom of the reservoir by means of pawls which are operated by the cover, ratchet notches being cut in the top edges of each of the rings. The lower edges of these rings are cut and bent to form buckets for carrying the earth toward the center as they are revolved.

Improved Harvester.

Christopher Lidren, La Fayette, Ind., assignor to himself and R. Jackson, of same place.—This invention consists of a pair of grab and carrying rakes suspended from a crane which is mounted on the platform of a two wheeled machine hinged to the truck frame. The crane may be any shaft arranged to swing it forward and back, and so adjusted as to hold the grab rakes during the time they are gathering the grain into a gavel, and also while they are detaining it. The rakes are so arranged, and have rakes to actuate them so contrived, that they are presented in an open condition above the grain on the platform at either end of the latter; they are then dropped down so that the ends of the fingers project below the grain through openings in the platform; then brought together at the middle, moving parallel, or nearly so, to the plane of the platform, raking the grain together in a gavel and securing it. They are next raised and swung around to the rear, and lowered and opened to discharge the gavel, after which they are thrown out of gear and allowed to remain until grain enough for another gavel has fallen on the platform, when they are put in gear again, raised, swung forward over the grain, and presented for taking another gavel, as before. The swinging of the crane is effected and the mechanism for raising, lowering, opening, and closing the rakes is so contrived and actuated by cams of peculiar construction on the axle that the whole is exceedingly simple in construction, and the operation is in no way impaired or hindered by the oscillations of the platform and the truck relatively to each other.

Improved Street Car.

William T. Jenks, Toledo, Ohio.—The object of this invention is to so construct the cars of street railroads that the body of the car may be reversed without the use of a turntable and without detaching the horses. A wheel is rigidly attached to the top of the frame of the truck, in the center of which is the king bolt. This wheel is made in two parts, or with a projecting flange on its rim. On the bottom of the car is a wheel of corresponding diameter. Hooks are attached to the bottom of the car, which hook over the projecting flange and hold the two wheels in contact, the wheel being the foundation upon which the body rests, and the king bolt the center upon which it turns. A spring lever is arranged on the front platform of the car, having a foot piece at its front end and a stop pin at the back end. A spring, which bears upward against the forward end of the lever with a constant pressure, throws the pin down, so that it engages with holes in the wheel when either end of the body is in proper position. To reverse the car, all the driver has to do is to bear with his foot upon the foot piece while he turns his horse round half a revolution to the other end of the truck. This action reverses the car, the team or horse being attached to the end of a draft bar, which is fast to the bottom of the car. The brake lever is connected to the king bolt as a fulcrum. The advantages over the ordinary street car are that the driver always occupies the same platform and the same position in regard to the fare box, and the heavy expense of a turntable is avoided.

Improved Extension Table.

Mathias Hofmann, Darlington, Wis.—This invention relates to a new construction of extension table. The table top is connected by toggle joints with the extension frames that constitute the table frame. Legs, in suitable number, support the table frame at proper hight. Each of the two frames supports, near its outer end, a plate, which, when the table is contracted, is directly under the top. When, however, the two frames are drawn apart, the top drops between the two plates and on a level with them so that then these plates form extensions of the table top. In order to contract the extended table, the top must first be raised to enable the plates to pass under it. When the table is contracted, the leaves may be doubled, being jointed for that purpose, so that their outer sections are placed horizontally against the ends of the top to furnish short extensions thereof.

Improved Milk Cooler.

Frank S. Oakes, Cattaraugus, N. Y.—This invention relates to a new apparatus for cooling the milk of which the cream is to be used for churning. It consists in so arranging water conducting pipes that the warmest milk and coolest water, and *vice versa*, will always be in the same or approximately the same plane or locality. The milk chamber or vessel in which the milk is to be cooled is made of sheet metal, of rectangular form. A water chamber surrounds the vessel and holds the same suspended by means of an inner flange. The discharge pipe projects from the bottom of the vessel through a hole in the bottom of the water chamber, and is packed by a rubber plate. A plug closes the discharge pipe. The bottom of the vessel is, at or near the middle, carried up to form a sort of partition. The partition is double, and contains two horizontal water conduits. The cold water is poured into the upper pipe through an inclined spout, and flows along the same, thence down into the water space within the water chamber. The coldest water, being first applied to the upper part of the elevated bottom, affects thus the upper stratum of milk. The warm part of the water ascends and finally flows out of the top of the vessel through a pipe. The partition is perforated, so that the milk can circulate from one side to the other of the vessel. In large dairies several of these devices are placed side by side, one slightly lower than the other, so that the water may from one vessel flow into the other until its temperature is nearly equal to that of the milk, and then be discharged.

Improved Paper Bag Machine.

Truman Hotchkiss, Stratford, Conn.—This invention consists in the improvement of paper bag machines. The paper of which the bags are to be made, being of the right width for the size of the bags when folded lengthwise, is wound in a large roll on a roller which is placed in the machine under a table, immediately behind the feed rollers and the shears, from which said roller the paper is to be fed at intervals through the shears to the folding apparatus by the principal feed roller, which will be moved exactly the same number of turns each time in order to feed off the exact length of paper required for each bag. The paper so fed out between the cutters comes on the plates on either side of a rectangular recess in the table, one edge coming under a spring and the other edge under a bar, which falls upon it to keep it down smooth and hold it so as to be drawn into the recess mostly from the other side. The movable shear blade then comes down and cuts off the length of paper to be folded. After the paper has been so delivered on the plates the margin on the outside of the spring and the margin along part of the end next to the cutters are pasted by bars, which till then rest in a paste trough. These being suspended by arms are at the proper time caused to swing over the paper and deliver the paste along the margins, and then to return back into the trough again. The paper being thus pasted and lying above the recess, is then pressed down into said recess for shaping and folding the body of the bag by the long rectangular former suspended above it, which comes down on the paper, carrying it to the bottom of the recess and folding it between its sides and the walls of the recess. The parts of the paper then rising above the former on each side are then folded over upon the top of the former, and pasted together. This completes the construction of the bag, and it is then raised up out of the folding recess to be discharged off the end of the former by the raising of the former itself, to admit another piece of paper below for the next bag to be made. The discharger carries off the bag, along the table, till the bottom comes in contact with the endless belt carrier, which conveys it to the front of the folding roller above where a folding blade comes down upon the upper side of the bag, just behind the upper edge of the bottom, to break down the upper side of the bag and tilt the bottom backward, so that the lower edge of the bottom will be drawn in between the rollers, in such manner that the cylindrical part of the bag will be folded down flat, and the stiff bottom will be folded over on a portion of the part above in passing between said rollers; at the same time the bag is delivered from the machine on the chute, and the upper portion is then wrapped around the bottom by hand, making a compact flat package that can be packed in boxes or bales without injury to the bottom. The folding cavity, former, pasting apparatus for the first pasting operation, the folding devices used in the construction of the bag, and the discharger, are all arranged in duplicate on two opposite sides of a frame or table, independent of the frame carrying the feeding and cutting apparatus, and the apparatus for folding and discharging the completed bag; and the devices for operating the said parts, so far as they are operative, apply to both in such manner that a double machine can be provided with less cost and complication of machinery than would be required for two single machines.

Improved Movement for Converting Motion.

Jefferson Peabody, Bangor, Me.—The object of this invention is to convert the oscillating motion of a beam, treadle, or lever into the rotary motion of a wheel or pulley, for use on a sewing machine or other instrument to be turned. The invention consists, principally, in connecting both ends of the oscillating lever or beam, by cords, chains, or belts, with the same side of the pulley to be revolved, so that whichever end of the lever may be depressed, it will draw the pulley around in the direction in which the string is being pulled, thus producing constant rotation of the said wheel or pulley during the oscillations of the lever.

Improved Folding Cradle or Crib.

Michael McNamara, Philadelphia, Pa.—This invention has for its object to furnish an improved cradle or crib, which shall be so constructed that it may be very compactly folded for storage and transportation. To the ends of the head and the foot boards are permanently attached the posts to which are fastened the rockers when used. The side boards of the cradle or crib are each made in four sections. The outer ends of the end sections are each hinged to a post, so that all of said end sections may fold inward. The inner ends of the two middle sections are hinged to each other, so that their inner sides may fold together. The outer ends of the said middle sections fold against the outer sides of the end sections. The slat or rack bottom of the cradle or crib, which is made in two parts, rests upon rabbets formed upon cleats. The outer ends of the parts of the bottom are folded against the end boards. The various parts of the cradle or crib, when opened out for use, are secured in place by suitable fastenings connecting the middle sections to the bottom. A piece of cloth or netting is detachably connected with the upper parts of the end boards, to form a summer bed or hammock to allow the air to circulate freely around the child. The cradle or crib is made wider at the top than at the bottom, so that when folded there will be an open space between the folds or sections of the side boards, into which the bedding may be packed. By this construction, by passing a strap around the cradle or crib when folded, it will occupy but little more space than, and may be carried as easily as, a carpet bag.

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Wanted—Agents to travel and sell "Stilwell's Pat. Lime Extracting Heater," and "Eclipse Turbine Water Wheel," on commission. Liberal inducements to good parties. Stilwell & Bierce Manufacturing Company, Dayton, Ohio.

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Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

We wish to correspond with some party who understands bleaching and refining oils. Any one who can bleach a dark, mixed oil, so as to make it a clearer merchantable article, will be well paid for doing it, or for the process. Samples sent on application to Lock Box 199, Pawtucket, R. I.

For 8, 10, 12 & 15 horse Steam Engines, with Link, cut-off, and reversing motion, address, for circular, E. West, Lockport, N. Y.

Plow Shares, Mold Boards, Cultivator Teeth, &c., cast to order, by Pittsburgh Steel Casting Co., Pittsburgh, Pa., of steel which can be worked same as wrought steel. All work warranted.

Tree Pruners and Saw Mill Tools, improvements. Send for circulars. G. A. Prescott, Sandy Hill, N.Y.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

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Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., New York—1202 N. 2d St., St. Louis, Mo.

Needle and Clock Machinery of every description of the most Improved Styles. Hendey Bro's, Wolcottville, Ct.

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All Fruit-can Tools, Ferracute, Bridgeton, N.J.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Conn.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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Patent Gearing—Great Strength, Durable, Noiseless, Cheap. J. Comly, 148 Ten Eyck St., Williamsburgh, N. Y.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York,

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

C. B. Colton & Co., West Gorham, Cumberland county, Maine, Agents for the Sale of Patents. This Firm is reliable.

For the best Endless Bed or (Farrar) Surfacer, address Davis, Hatch & Co., 436 North 12th Street, Philadelphia, Pa.

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The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

Notes & Queries

F. H. Q. asks: How can I harden steel for turning solid emery wheels?

C. asks: How many 12 inch bastard files can a good workman cut in an hour by the old method?

J. L. S. says: How can I make soft water hard? Has hard water less solvent power than soft?

J. K., Jr., says: I would like to know of a process by which I can soften plaster that has been long set and is very hard. I want to remove globes from lamps, etc.

E. B. asks: Will an achromatic telescope, with 1¼ inches object glass, and 23 inches long when extended, answer for the telescopic portion of a spectroscope?

J. M. asks: What method is employed by mechanics to trace a spiral on an octagonal or round stick of timber, 6 or 7 inches diameter, to make what is called a conveyer or creeper, to carry grain or flour?

J. L. S. says: Moths have got into my rep covered furniture and are gradually eating it up. They appear to be in the interior among the hair. Can you tell me how I can destroy them without having the furniture re-upholstered?

W. F. D. would like to know of the whereabouts of the Master Mechanics' Association, when the next meeting takes place, who are the officers and where they reside, and if they offer a premium of $25 for the best plan for removing snow from railroad tracks. If he could invent a plan that would do it successfully, would it be worth while to secure a patent?

S. wants a good white preservative for wood work on buildings which are exposed to sulphuretted hydrogen from sewers. White lead turns yellow in a very short time, and zinc is not much better. No joints can be kept tight on these buildings, which are erected on piles on river sides and are exposed to the shocks of boats.

A. O. asks: Why is it that the water in a kitchen boiler will not become hot when there is a leak in the supply pipe? I had such a case a few days since, where the boiler had not been hot for a number of weeks. I found that the valve of a water closet in the yard was leaking; as soon as I repaired it, the water in the boiler became as hot as was necessary.

J. K. W. asks if some correspondent will inform him as to whether the use of coal or kerosene oil on hones is injurious to the stone or the steel; "I have used it for several years, but some mechanics say that it is injurious to chisels and plane bits, causing the edges to crumble or break off. Its cheapness is in its favor, and it does not gum like other oils."

W. A. S. says: I have a house that was plastered in the coldest weather of this winter, and I put in stoves to dry it. I drove the fires so hard that the walls are colored in some places with the smoke or gas. Can some one inform me of a whitewash that I can apply to cover up the stains, which will not cause paper to peel off if I paper the house in the fall? The paper hanger says that it will not do to paper before the plaster is thoroughly dry. What had I better do?

R. W. says: I am making an article, of many pieces of black walnut, so put together as to fold up. The joints are made by screws. As the joints must be tight, the screws turn outward in operating it. For more than a year I have been trying experiments to remedy this. The best I have done is to use flat head screws with tallow on the shank and head. But even then the screws will turn when driven up quite tight. Rivets are not desirable. If any one knows of a better way, I should be glad to hear from him.

W. C. asks: Is there anything with which I can fasten leather to iron that is constantly immersed in water? Is there any metal of which I can make a ring that will expand while being put on and contract in contact with pressure, so as to form a watertight joint? I have 10 rams packed with leather; they work very well for two or three days, but then commence leaking. The only way in which I can stop them is by caulking with cotton yarn, which only lasts for a short time.

W. V. J. says: I have a sectional boat, composed of zinc with a wooden bottom and end boards. In transporting it to the country it became so strained as to make it leak badly. The zinc is fastened to the wood with galvanized nails and white lead. I used pitch on the seams but it wore off too quickly, and did not stop the leaks. The boat scraped on bottom of river on going over rifts. Would enamelled cloth put on with marine glue stop the leaks? Would it stick to the paint on the boat, or should I use asphaltum, melted and put on like paint? Would it wear off easily and would it stand the heat of the sun? Is there any other cement or preparation I could use? What are the constituents of marine glue?

Answers to Correspondents

M. says: I want to know if a 6 inch double belt will drive as much power as a 12 inch single belt, on a smooth surface. Will not a 12 inch single belt do three times as much work as a 6 inch double belt? Does it not take more power to drive a double heavy 6 inch belt than a 12 inch single belt? What material for a pulley face is the best for getting the most power, mahogany, leather, polished iron, or rough iron? Answer: We should expect rather the best result from the double belt, if stretched to same tension per square inch of section, and properly laced or riveted. Leather covered pulleys are best. Consult the papers of Mr. J. H. Cooper in the *Journal of the Franklin Institute* for the past two years. They form a perfect encyclopedia on the subject.

C. F. S. says: A train of 100 cars must ascend a grade too heavy for one engine, and a second one is called on. Now where should the engines be to accomplish the best results, both in front, or one in front and one in rear, or one in front and one in the middle, or one in rear and one in middle? I claim that if both are ahead, they are not drawing alike, one draws on the following and *vice versa*. I claim that they will work best with one ahead and one behind, each engine pulling and pushing 50 cars. Answer: Merely as a matter of convenience, we should suppose it better, on a straight track, to place both engines together, so that the engineers may communicate with each other and work together. On a curve, it would be better to give each a half of the train, probably.

B. C. B. says that G. S. N. speaks of using petroleum for taking the scale off the flues of boilers. "I would suggest to all who have difficulty in that way to use ¼ gallon petroleum and from 6 to 10 lbs. of sal soda to a fifty horse power boiler. I have been using this for six months, putting the quantity named once in every two weeks in the boiler, and I find it both cheap and effective. It should be put in after the boiler has been thoroughly cleaned."

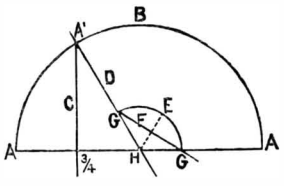
R. M. R. says: I am making a copper boiler. It is 10 inches long and 5 inches diameter, and is to be brazed together. The ends of the boiler are convex outwardly; and having brazed in one head, how can I put the other in? Are there any rules applicable to find the dimensions for small boilers to suit engines? Answer: There are no rules applicable to very small boilers. They vary too greatly to allow of general rules. Drill a hole in the head, put in a steady pin, or screw or solder on a slip of tin for a handle by which to steady the head. Then proceed as with the other one.

A. T. B. says: What size cylinders (for double engine) should I use in a twenty-five foot boat? What is the best style and size of screw to make ten miles per hour? I have got a double engine 3½ inch stroke by 3½ bore; will it do? Answer: See answer to A. & Y., page 75, current volume of the SCIENTIFIC AMERICAN. We should expect a very high pressure and a high speed of engine would be required. Put in as large a "true screw" as the boat will take.

Y. C. E. says: I wish to know a formula by which I can calculate the number of gallons per minute of discharge of a fire engine with an 8 inch cylinder and the nozzle of the discharge pipe ⅞ of an inch diameter. Answer: We have not at hand such a formula as is asked. We should be obliged to any manufacturers of steam fire engines who will give us useful statistics and rules for proportioning them.

G. D. asks: 1. How much water does an ordinary canal boat draw, and what is the full depth? 2. There is a cylinder, 30 inches in diameter, with a pump forcing water into it. The pump is 4 inches in diameter; and there is a discharge pipe from the cylinder, 2 inches in diameter. If a force of 40 lbs. is applied to the piston, with what force shall I discharge the water from the pipe, which is only ¼ the diameter of the pump? If possible, I would like to know what pressure in pounds per square inch the water exerts in its exit from the pipe. Answers: 1. Canal boats are of different sizes. A large boat draws 5½ feet loaded, and is 100 feet long, 17 or 18 feet beam, and about 8 feet depth of hold. It weighs 60 or 80 tuns, and carries from 175 to 200 tuns of coal. 2. The pressure will be somewhere about 2 pounds per square inch, as a maximum; experiment only can determine it.

A. H. G. says: To calculate the lap of a slide valve, let A A be stroke of piston, and B, path of crank. Space off on piston line A A the distance which the piston must travel before steam is cut off (in this diagram, at ¾ stroke). At this point, erect the perpendicular line C, striking B at A'; draw the diagonal D, striking piston line at H and crank path at A. Now ascertain the travel of the valve, take half it, and with the dividers set at half the travel, set one leg at H, for a center, and scribe the arc terminating at G G; draw the diagonal F. The space from H to F is the required lap; from F to E, the opening of port. Answer: The construction is conveniently made and is accurate.



G. W. M. says: I am learning to electroplate with a galvanic battery. My battery and connection wires seem in perfect working condition and the battery begins to act when the positive and negative wires are joined together; but when these are immersed in the gold or silver solution, the battery power seems to subside altogether unless I connect them in the solution, when the negative receives only a slight coating. Can you tell me a remedy for the defect? Answer: All metals are electro-positive, and are attracted from their solutions to the zinc or negative pole of the battery, and whatever substance they may be in combination with passes to the positive pole of the battery; if you are plating a teaspoon or any article about that size, with silver, you must solder or otherwise fasten to the wire leading from the positive pole of the battery a sheet of silver, about three inches square; hang this sheet in the silver solution; then having carefully cleaned and connected the spoon with the negative pole, suspend it in the solution about three quarters of an inch from the sheet or plate. In most electroplating the plate fastened to the positive pole must be of the same metal you wish to coat with. Thus for gilding a gold plate, for copper plating, a copper plate, is used. This plate or sheet is gradually consumed to keep up the strength of the solution, but it has also another important use as an electrode. Although metal solutions are good conductors of electricity, they are poor compared with the metals themselves; and the plate serves as an electrode to conduct the battery current to many parts of the solution at once; thereby enabling more electricity to pass, and consequently to deposit more metal. The telegraph companies connect their earth wire with the water pipes, on the same principle, and it is here where you fail; connect your positive wire with a sheet of metal (the thicker it is, the longer it will last) and you will have no trouble in depositing the metal thickly and heavily, with even a moderate battery power.

W. W. The rules formerly in use were based, as are those given in the letter of our correspondent, upon the diameter of cylinder, and were about right twenty-five years ago, simply because the range in sizes of engine, as well as in pressure of steam, etc., was very limited. In fact, however, the majority of such rules are not based on any true laws of proportion. Accurate rules are given for the principal parts of engines by the authorities noted at page 106 of present volume of the SCIENTIFIC AMERICAN. Our editorial columns will occasionally contain articles which will more fully reply to our correspondent. He and his shopmates should spend some of their leisure hours in the study of algebra, after perfecting themselves in arithmetic, in order to be prepared to study those treatises.

Baltimore. We have received a communication with the above signature, without date, and unaccompanied by the name and address of the writer. We shall be pleased to reply to the question asked when sent us in proper form.

O. A. asks: How many screws of one foot diameter, at a speed of one hundred revolutions per minute, would a keel boat 16 feet long x 4 feet wide x 2½ feet high, use, to run the boat, when empty, at a speed of a mile in 15 minutes? Answer: See page 75, current volume, SCIENTIFIC AMERICAN, answer to A. & Y. Two screws are sometimes used; never more than two.

A. H. S. asks: What is your method of computing the power of stationary engine? Answer: Multiply the area of piston, average pressure upon it per square inch throughout the stroke, the length of stroke, and twice the number of revolutions per minute, together; then divide by 33,000 to obtain the actual horse power.

J. H. B. says: Is steam in a boiler under pressure a conductor of electricity? What is the conducting power of water as compared to iron? Answer: Steam is not a conductor of electricity. Water is usually considered a conductor, but the metals are all infinitely superior to it.

C. I. says: I would like to know what portion of the power of the engine is usually used to carry the piston and connecting rods, or how much power is used to carry a hundred pounds of piston rod with two feet stroke, making two revolutions per second? Answer: As an average, the pressure on the piston required to move the engine itself varies, from 3 or 4 pounds per square inch in small engines down to from 1 to 2 pounds in the largest sizes.

J. H. asks if the "steam man" has ever walked or run by steam with the feet upon the ground? "I refer to the steam man first exhibited in New York city and afterwards through the United States. Is it possible for it to walk or run with the feet upon the ground, as constructed and exhibited?" Answer: Yes; we believe it can and does.

J. B. J. says: The San Francisco *Sunday Chronicle* contains an article purporting to be a report from the United States Consul at Bruges, Belgium, to our Secretary of State, from which it appears that a certain "International Board of Subterranean Exploration" have been boring into the earth for many years, and have at length reached the depth of 37,810 feet, at a place called Dudzeele in Belgium. Among other important discoveries was one which was quite unlooked for, namely, the annihilation of some of the party by the molten earth, which was pouring up through the perforated shell and which, according to one *savan*, would continue to flow forever; according to another, it would only flow sufficiently long to inundate Holland, Belgium, Denmark and a few other unimportant localities, filling up the North Sea with lava and connecting England with the main land, etc. These ideas are slightly novel, but I have seen no mention made of them in the SCIENTIFIC AMERICAN, my oracle in such things. I feel a little skeptical at present; but if you are posted and will endorse the above, I suppose I must button my faith to it. Answer: We are flattered by the expressions of confidence from our correspondent, but we decline to endorse the statement of the California journal. It is not probable that the earth's crust could be pierced, not only to a depth of 7 miles but entirely through to the regions of fire, and the matter be kept a profound secret from all the scientific world, except the *Sunday Chronicle* of San Francisco.

J. A. L. sends us a stone, hoping that it is a diamond, and asks what it is. Answer: We are sorry to say the specimens prove to be water-worn fragments of liquid quartz. In hardness and gravity they fall far below the diamond.

W. M. asks for directions for kalsomining. "If the walls absorb moisture too fast, what can be used to prevent it? Will Spanish whiting do as well as Paris white for kalsomining?" Answer: Put on several coats of the kalsomine wash, letting each dry before applying another. Spanish white and Paris white are the same thing. See page 351 of our volume XXIV.

F. D. asks: What kind of engine is used in the Lay torpedo that was tried at Newport a short time since, and how much power did it use? How many cells are there in the battery used as motive power? How much would the engine and battery weigh to make half a horse power? Answer: See page 385 of our volume XXVII.

J. M. asks: Is there any work in English, French or German, that gives practical instructions for laying out the teeth of wheels in actual construction? Answer: Read J. I. Hawkins' translation of M. Camus' treatise on the teeth of wheels. If a copy of the "Engineer's and Machinist's Assistant" is accessible, read the article on gearing, which is about the best treatise, for general purposes, published. An excellent abstract of this article will be found in Appleton's "Dictionary of Mechanics."

J. B. sends us some mineral specimens, and requests an opinion as to their value. Answer: All the specimens are only varieties of chalcedonic quartz. The one (weighing about 10 grains) which is dark red and translucent is the variety called carnelian, and is the only one which a lapidary would want. But small carnelians are of little value. The cutting gives the chief value to nearly all gems.

T. B. wants a recipe for making bronzed lacquer for gas fixtures, and asks if there are any works on lacquers and bronzes? Answer: Read Byrnes' "Practical Metal Worker's Assistant,"

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S. B. asks: Is it necessary to have a ventilator on the top of an icehouse? The icehouse is entirely out of the ground, and I was told that, unless I put a ventilator in, ice would not keep in it. Answer: For the preservation of ice, ventilation is unnecessary.

T. B. asks how to calculate the capacity of square and round tanks. Answer: The capacity of a square tank is the length, breadth, and depth multiplied into each other. The capacity of a round tank is the depth, the square of the diameter and the constant ·7854 multiplied into each other.

S. A. says: We have two boilers 14 feet long, 5 feet diameter, with 107 three inch tubes in each boiler. The bricklayer built the bridges 5 inches from the bottom of boilers, and gradually sloped the brick to within two inches of the boiler at back end. He likewise built the bricks close to the boilers along the sides, 18 inches from the top tubes. The chimney is 110 feet high, which causes a very strong draft. Question: Are the bricks too close to the boilers at back end, and should we gain more heating surface on the sides, by having the brick work close to the boilers nearer water line? We burn fourteen cords of wood per day; we think it is too much. Answer: The brick work at back end should approach the boiler closely, unless it checks the draft. As we are not told how much work is done by the 14 cords of wood, we cannot form an opinion as to whether the amount is extravagant or not. The heating surfaces of the boiler should be uncovered by brickwork nearly up to the water line.

S. L. C. asks: What is the most economical method of using steam in a rotary engine? Would it be advisable to admit the steam twice during each revolution, and, at each admission, use its expansive power to drive the piston through one quarter of the circle? I would like to purchase the right of a good rotary steam engine. Have any of your patrons such a one to sell? Answer: There are many rotary engines in the market, and the number patented is very great. Some of them are probably efficient, but we know of none which have been tested, by reliable and skillful engineers, with results that have justified publication. There were several exhibited at the Fair of the American Institute last fall, which attracted some attention. The same natural laws govern the action of steam in a rotary as in a reciprocating engine.

J. B. asks our opinion on feeding a flue boiler 18 feet long by bringing the feed pipe through the boiler head near the bottom in the usual way, and running it up inside the boiler between two 16 inch flues, the said flues being 3 inches apart and 3 inches from side of shell. He further says: Why not feed there as well as at bottom of boiler and on first sheet? What would be the difference, and would there be any danger in so doing, the said boiler being over a puddling furnace? Answer: Feeding there will do as well. Keep the discharge opening well under the water line, however, to avoid injecting the feed water into the steam space, if the water should be carried low.

W. R. asks: Will a pendulum vibrating in a vacuum, free from friction at the point of suspension, ever cease to move? If two pendulums of the same length, metal and pattern, one weighing 10 pounds and the other 1 pound, commence vibrating in the air at the same instant, free from all impediment except the friction of the air, which of the two will stop first? Answer: A pendulum vibrating in vacuo, on a frictionless arbor, would never stop. In air, the heavier the pendulum, the longer will motion continue.

C. E. C. says: Will you please inform me what decarbonized steel is, and how it is made? How do it and laminated steel compare for use in gun barrels? Answer: The terms are not recognized by metallurgists, but are trade designations. We are not certain as to the other points of the inquiry. A "low steel" containing about one half of one per cent carbon, and free from impurity, is the best material known to engineers for purposes requiring both strength and toughness.

J. S. B., of Mich. The mineral you send is iron pyrites, of no value. Write directly to the party about the piano invention. His address was published.

H. W. U. asks: Why are there not more low pressure steamboats on the Mississippi river, or are there any at all? Answer: Because the water of the Mississippi is seriously laden with earthy matters; because the shallowness of that river, and of its tributaries, makes it necessary to adopt the lightest possible style of machinery, and because the high pressure noncondensing engine, with plain cylindrical boilers, apparently best fulfils the requisites of successful engineering there. With surface condensation it seems to us not at all improbable that condensing engines would succeed.

C. M. N. says: I would like to know the pressure (on a check valve for ¾ inch pipe, the steam pressing upward on the mound-like face of said valve) required to raise a weight of 60 pounds. The valve has a face like a watch crystal. Some time last summer or fall, said valve, acting as a safety valve, would not work on account of the stem, which had suddenly become too tight, although it had been used for about 18 months and I never had any trouble with it before. I think it is getting as bad as ever. Please explain. Answer: 1. The pressure per square inch is the same as for a valve with a flat face. 2. Examine the valve and stem and you will be able, probably, to determine, for yourself, the cause of trouble. That is what we should find it necessary to do before we could reply to the question asked.

H. P. I. asks: 1. How much water will be discharged per minute by a pipe 4½ inches diameter from a source 1½ miles distant with a fall of 75 feet; and to what hight will water be thrown at the point of delivery through a given sized nozzle? 2. How much water will be discharged by such a pipe under same circumstances into a distributing reservoir sixty feet high, that is, fifteen feet lower than source? Answers: 1. About 30 cubic feet. 2. About 12 or 15 cubic feet.

H. J. D. says: 1. What is the difference between cold water and steam pressure in testing steam boilers? 2. Is there any danger in covering steam pipes with hair felting, the steam not being superheated and oil kept from the felting? 3. Is there any danger of spontaneous combustion to be apprehended from waste filled with the petroleum oils, paraffin, etc.? Answers: 1. There is no difference in the amount of pressure exerted. Hot water expands the metal of the boiler, and closes up slight leaks, and thus places the boiler under conditions more closely approaching those of every day use, under steam. 2. No. 3. We are not certain that there would be absolutely no danger. There would certainly not be nearly as much as if the oils were animal or vegetable.

J. P. asks: With what force will water falling in a vacuum, from a hight of twenty feet, strike upon every square inch of surface at the bottom? Answer: It is generally found to be equal to twice the pressure due to the hight of fall.

J. M. W. asks: What are the component parts of coal ashes? Answer: These vary with the species and quality of the coal. Pennsylvanian anthracite coal gives: Carbon, 90·45, hydrogen, 2·43, oxygen, 2·45, ash 4·67; Newcastle cannel coal gives: Carbon, 78·06, hydrogen, 5·80, oxygen, 3·12, nitrogen, 1·85, silicon, 2·22, ash, 8·94; Pennsylvanian bituminous coal gives: Carbon, 68·82, volatile combustible matter, 17·01, and ash, 13·35.

S. S. says: I am running a 12x20 engine for saw mill. The boiler is a two flue, 22 feet long by 42 inches diameter, with a usual pressure of 60 lbs. When the engine runs at about 200, the boiler shakes to a fearful extent. What makes it shake? Is there more danger of explosion when a boiler shakes than when it stands steady? Answer: If, as we presume, the boiler and engine are mounted on the same frame or the same foundation, the boiler is probably shaken by the engine, the reciprocating parts of which are not balanced for so high a speed. A boiler already too severely strained might be exploded by a severe "shaking," as, possibly, were three of those at Pittsburgh, the other day, by the explosion of the fourth.

J. P. N. says: I would like to have an explanation of the sun dogs. In the summer of 1831, in the afternoon, sun about an hour and a half high, I saw two, one on each side and on a line with the sun; but I do not remember to have seen the upper one, nor anything like a circle, and the two were not very bright. This morning, February 13, at half past 8, I observed, for some ten minutes, two bright ones, one on each side of the sun and one above it, not quite so bright but longer; and between them and below was formed nearly a complete circle of pale white light similar to a circle around the moon. The colors were yellow and orange. Answer: The halo around the sun, called parhelia, and the mock suns are due to the refraction of light occasioned by floating solid particles of ice in the air. Such, at least, is the explanation given by Brewster and others.

M. asks: Is it necessary to keep quicksilver from the air? In confining it in one of the hollow glass tubes used on steam boilers for water gages, what could I seal the ends with? What is the red liquid used in thermometers? Answer: Quicksilver ought to be put up in stoppered bottles to keep out the dirt and prevent the formation of a film of oxide on the surface in warm localities. It is a poisonous substance and must be handled with care. Where mercury is employed about steam boilers, it is well to protect its surface with a little glycerin. The red liquid in thermometers is usually alcohol tinctured with an aniline color.

M. D. asks: What is the best wine made, and its value; and is it made in Germany or France? Please state which is the best produced in the said countries, and its value, and the quantity grown in each country. Answer: The best wines come from Germany and France. Champagne is a true grape wine, and is chiefly made in France. The statistics of production we have not at hand.

W. M. asks: In what volume and number of the SCIENTIFIC AMERICAN was the best way of making collodion published? Answer: It is easier to give the best process for preparing collodion than to hunt up an old reference. Dr. Van Monckhoven recommends the following: Dissolve 10 drams pyroxilin (of no matter what quality) in 1 quart each of alcohol and ether; pour the liquid into a vessel holding 10 quarts of water and shake well. The resulting precipitated pyroxilin is placed upon a filter of muslin, washed and dried, and is found to weigh from 5 to 9 drams. This product is only feebly inflammable, almost totally soluble in alcohol, and, even if obtained from the most inferior gun cotton, it will produce very superior collodion. No matter in what manner the collodion is iodized, its consistency will remain the same. Iodide of cadmium does not thicken it, as is the case with ordinary collodion. Neither do iodides of sodium and ammonium make it thinner.

T. L. sends a sample of boiler deposit and asks how to treat it. Will a large filter remove it, if boiled before filtering? Which shall I filter through, hard or soft wood shavings? How shall I remove the scale from boiler, which is small? What is the deposit? Will it adhere to wood? What shall I apply to a shingle roof to make it less liable to burn in case of fire? Answer: The incrustation is chiefly sulphate of lime with organic matter. Tannate of soda, to be obtained of wholesale chemists, with directions for use, is said to prevent the formation of deposits in boilers.

C. says: Please tell me the best ingredient to make faded hair a nice dark brown, without injury to hair or scalp. Answer: We have seen it stated in a German journal that the following hair dye is entirely harmless, but do not recommend anyone to use this or any other preparation. Mix 10 parts of the subnitrate of bismuth and 150 parts of glycerin, and heat in a water bath; gradually add caustic potash solution under constant stirring until a clear liquid is obtained, and then render the whole neutral by means of a concentrated solution of citric acid. Enough orange flower water is added to make the whole liquid weigh 300 parts. A small quantity of a solution of an aniline color to suit can then be put in to complete the preparation.

A. L. asks whether the mineral enclosed in his letter is of any value, and of what it is composed. Answer: It is specular iron ore, a variety of hematite.

S. B. D. says: Please examine the enclosed four specimens of minerals and tell me what they are, and of what value. Answer: The fragments are too small for satisfactory determination. No. 1 is calcite; No. 2 appears to be zinc blende; No. 3 is ferruginous quartz, and No. 4 resembles red hematite.

G. E. B. asks how to temper steel shanks for shoes, a quantity being done at once. See page 139 of our current volume (A. O.'s answer to L. H. W.)

B. W. C. asks how to find the length of the line B C, in our answer to F. E. D. on page 123 present volume. Answer: B C is the square root of the difference between the squares of A C and A B.

F. S. says, in answer to T. C. C. who asked how to remove scale already formed on the internal surface of a boiler: You may use common sal soda solution in your boiler to remove scale if it be sulphate of lime. I had the same trouble once, and could keep the boiler perfectly clean by the constant use of the sal soda solution, which does not injure the boiler.

R. B. M. says, in answer to D. M.'s question about a leaky roof: Your roof leaks from the action of ice on the solder, which contracts with cold and expands with heat sufficiently to open a crevice for the water from the ice when it melts. Your roof is several degrees warmer at the apex than at the eave, and hence the snow from the apex, warmed by the internal heat, melts; it congeals again at the eave, thus forming an ice dam, which opens the solder and from which the water sets back and leaks through the crevice. Apply artificial heat to the eave, or artificial cold to the apex, so as to have the eave warmer than the apex. See Patent No. 115,340 dated May 30, 1871.

J. B. H. says that H. C. D., who asked if the oil in feed water (introduced in exhaust steam) will injure a boiler, is answered well; "but I would say that crude or common black lubricating oil mixed with feed water and injected will not cause foaming; and if enough is used, all the steam will be greasy, and the engine will work very nicely with it. I have used it, and I know a case of an old boiler, considered dangerous for many years, which is now considered safe. The scale fell off from all smooth places, but all the crevices and leaks are well filled with hard substance. In such places the oil does not soften the scale."

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Boiler Strains. By J. C.

On the Nebular Theory and on Kepler's Harmonic Law. By E. H. P.

On the Causes of Boiler Explosions. By A. W. M.

On the Transplanting of Trees. By M. A. G.

On the Influence of the Earth's Central Fires. By H. P.

On the Chemical Constituents of the Honduras Blood Spring. By O. L.

On the Use of Phosphorus in Medicine. By L. J. F.

On Iron Clad Ships of War. By G. J. R.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 11, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Bale tie, P. K. Dederick	135,700
Bed bottom, E. G. Cameron	135,774
Bed bottom, T. L. Odell & Hudson	135,724
Bed bottom, Ogborn & Kendrick	135,725
Bed bottom, Ogborn & Kendrick	135,835
Bed bottom, R. Rakestraw	135,844
Bedstead, S. Caro (r)	5,275
Bedstead, sofa, J. B. Herlow	135,643
Bell, call, H. Stratton	135,860
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Boiler feeder, automatic, S. Cook (r)	5,276
Boiler feed apparatus, R. Berryman	135,757
Boiler fire plate, E. Boileau	135,759
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Boot soles, trimming, L. Cote	135,694
Boring machine, I. Cory	135,698
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Buckle, harness tug, C. W. Adams	135,744
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Bustle, J. H. Hall	135,801
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Car coupling, Royal, Lentz and Delbert	135,849
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Razor, E. A. Freeman	135,703
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Rope, etc., preserving, W. H. Torrey	135,835
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Spool, A. Carmichel	135,626
Spool case, J. D. Cutter	135,728

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Steel, T. Brooks	135,768
Stone, cutting, A. S. Gear	135,642
Stop cock cover, F. H. Laforge	135,822
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

23,996.—SURGICAL SPLINT.—D. Ahl. April 30.
24,034.—RAILROAD FROG.—D. D. Lewis. April 30.
24,428.—TRIP HAMMER.—B. Hotchkiss. May 28.
24,451.—ATTACHING HANDLE TO PAIL.—T. Evans. June 4.
24,688.—BORING MACHINE.—L. Worcester. June 18.

EXTENSIONS GRANTED.

22,812.—ROLLING HORSESHOE IRON.—W. W. Lewis.
22,941.—CAR SPRING.—A. B. Davis.
23,011.—WATER WHEEL.—N. F. Burnham.
23,022.—MOLDING COVER FOR STOVE.—G. W. Gardner.
23,032.—STEAM PRESSURE GAGE.—T. W. Lane.
23,034.—FIRE PLUG.—J. L. Lowry.

DISCLAIMERS.

22,812.—HORSESHOE MACHINE.—W. W. Lewis.
22,941.—CAR SPRING.—A. B. Davis.
23,035.—PRESSURE GAGE.—T. W. Lane.

DESIGNS PATENTED.

6,385.—LAMP.—D. Ashworth, Kenton county, Ky.
6,386.—CARPET.—J. H. Bromley, Philadelphia, Pa.
6,387 to 6,409.—SHAWLS.—F. Wink, Philadelphia, Pa.
6,410.—LANDAU SLEIGH.—J. C. Goold, Albany, N. Y.
6,411.—FENCE.—J. I. Healey, Brooklyn, N. Y.

TRADE MARKS REGISTERED.

1,123.—DRESS PATTERN.—W. Cornwell, Philadelphia, Pa.
1,124.—MEDICAL COMPOUND.—E. Frese, San Francisco, Cal.
1,125.—PACKED SALMON.—L. L. Newton, Brooklyn, N. Y.
1,126.—AXES, ETC.—Collins Co., Collinsville, Conn.
1,127.—HARVESTERS.—Whiteley, Fassler & Kelly, Springfield, Ohio.
1,128.—SELF RAKE.—Whiteley, Fassler & Kelly, Springfield, Ohio.
1,129.—GUARD FINGERS, ETC.—Whiteley, Fassler & Kelly, Springfield, Ohio.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On an application for Design (7 years)	$15
On an application for Design (14 years)	$30

VALUE OF PATENTS

And How to Obtain Them.

Practical Hints to Inventors

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*. This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, New York, for full particulars.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Canadian Patents.

On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

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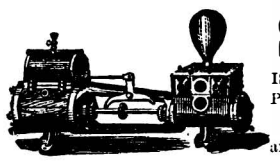

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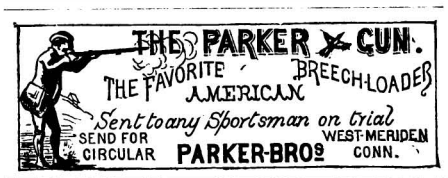

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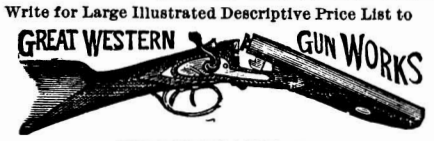

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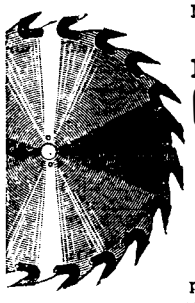

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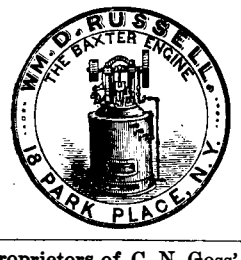

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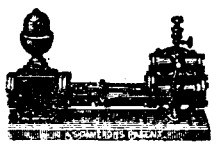

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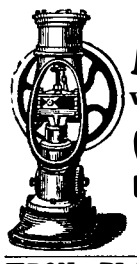

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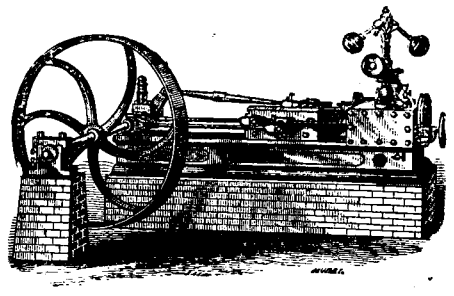

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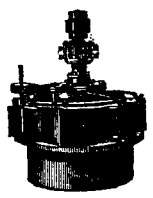

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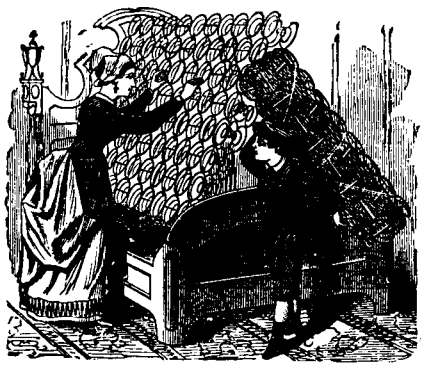

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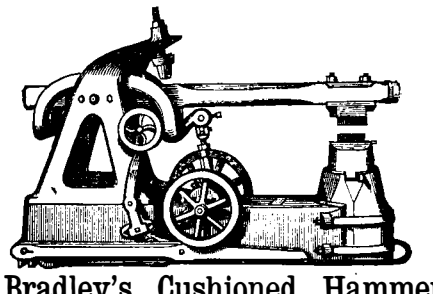

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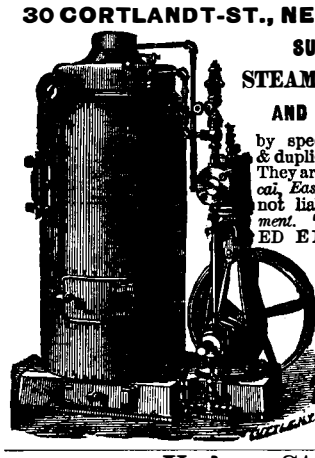

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